

Coastal Resources

The Coastal Resources element of the Comprehensive Plan updates the 1990 Mashpee Coastal Resource Management Plan / Municipal Harbor Plan to include issues specified for Local Comprehensive Plans, and reflects extensive participation by the Town's Waterways and Shellfish Commissions and the public. It focuses on the preservation and management of coastal areas, the preservation and possible expansion of public access to, and use of, the coast, the regulation of development in high hazard areas, maintenance and improvement of coastal ecosystems and marine-based economic activity, and the provision of safe navigation on town waterways.

Mashpee's coastal resources include flood hazard areas, dunes, barrier beaches and coastal banks, significant shellfish habitat areas and "working waterfront" areas. As part of the development of this Plan, these have been inventoried, along with harbors and their uses, dredging projects and waste facilities. Commercial and recreational water-dependent uses of the shoreline, and facilities and improvements that provide or enhance public access, are also listed.

Coastal resources are analyzed in terms of environmental sensitivity, water vs. non-water dependent uses, conflicts between those uses, adequacy of existing shoreline facilities, dredging and maintenance needs, water quality, shellfish habitat and development in high hazard and eroding shoreline areas. Issues surrounding the rapid erosion and potential loss of Popponesset Spit are also discussed.

The former Coastal Resources Management Committee served as a planning subcommittee for the Coastal Resources plan, recommending goals, objectives and policies to the Planning Board. Development of the text of the plan was done by a working group consisting of the Town Planner, Assistant Planner, Shellfish Constable, Conservation Agent, Harbormaster and Leisure Services Director. In addition, the Waterways, Shellfish and Conservation Commissions reviewed this element and provided their input and comments. Waterways Commission Chairman Jim Hanks and Vice Chairman Dr. Bennett Gordon contributed valuable information to the development of this element. Frank Hicks of the Historical Commission provided information about the historic rights-of-way leading to the sea.

Based on the recommendations of the Coastal Resources Management Committee, the Planning Board proposed, and Town Meeting approved, the following Coastal Resources Goals & Objectives:

Goals & Objectives

GOAL #1. TO MAINTAIN AND IMPROVE COASTAL WATER QUALITY FOR SHELLFISHING AND / OR SWIMMING IN ALL COASTAL WATERS AS APPROPRIATE, AND TO PROTECT THE HEALTH OF OUR COASTAL ECOSYSTEMS.

GOAL #2. TO MAINTAIN AND ENHANCE PUBLIC ACCESS TO AND ENJOYMENT OF MASHPEE'S COASTAL RESOURCES WITHOUT DEGRADING THOSE RESOURCES.

GOAL #3. TO MINIMIZE OR PREVENT LOSS OF LIFE, PROPERTY DAMAGE AND ENVIRONMENTAL DAMAGE RESULTING FROM STORMS, FLOODING, EROSION AND, SHOULD IT BE PROVEN TO BE OF SIGNIFICANCE FOR OUR COAST, RELATIVE SEA LEVEL RISE.

GOAL #4. TO PROVIDE FOR SAFE NAVIGATION ON MASHPEE WATERWAYS.

GOAL #5. TO ENHANCE THE ECONOMIC BENEFITS OF THE TOWN'S COASTAL RESOURCES WITHOUT DEGRADING THOSE RESOURCES.

Objectives

- A.** To ensure that the location and design of new and replacement septic systems and other wastewater treatment facilities will not adversely affect coastal water quality.
- B.** To prevent any new direct stormwater discharges into coastal waters or wetlands and to reduce contamination from existing sources of runoff.
- C.** To reduce nutrient loading from septic systems and other land use-generated water quality impacts on the Waquoit and Popponesset estuarine systems so as to maintain their long-term ecological health.
- D.** To minimize or eliminate boating-related contamination of estuarine waters or degradation of estuarine habitat.
- E.** To develop an ongoing capability to monitor water quality conditions and changes in water bodies and to evaluate the impacts of actions taken toward water quality improvements.
- F.** To minimize or avoid the loss of shellfish habitat and damage to wetlands due to new dock construction and use or to dredging and other navigational improvements.
- G.** To maintain buffer areas landward of coastal wetlands and shorelines in order to protect wildlife habitat, the functioning of wetlands and the aesthetic character of Mashpee's shoreline, and to minimize storm damage.
- H.** To ensure that marine fueling facilities are upgraded and maintained in accordance with best management practices to avoid adverse impacts on water quality.
- I.** To ensure that development and redevelopment does not interfere with existing public access and traditional public rights-of-way to and along the shoreline or with public rights of fishing, fowling and navigation.
- J.** To improve public access to the coast by acquiring and developing new access points and upgrading existing access, including reasonable accommodations for disabled persons.
- K.** To provide adequate launching, mooring and other marine-related facilities for boating and other uses of the water without adversely impacting the town's environmental and natural resources.
- L.** To avoid, if possible, any change on coastal sites from water-dependent uses to non-water dependent uses.
- M.** To provide for the safe use of Mashpee's waterways by boaters without adverse impacts to our environment or to traditional navigational and recreational water surface uses.
- N.** To increase Town officials', residents' and visitors' knowledge and understanding of the ecology of coastal and estuarine systems in order to promote improved stewardship of those resources.
- O.** To ensure that development in coastal flood zones is designed so as to minimize the loss of life or property, or environmental damage due to coastal storms.
- P.** To prevent any new development and to discourage redevelopment or expansions on barrier beaches or coastal dunes, as defined by the Wetlands Act and associated regulations and policies, in order to maintain their wildlife habitat value and ability to reduce storm damage to landward areas.
- Q.** To ensure that development on or landward of a coastal bank or dune is designed and located so as to have no significant adverse effect on the height, stability or the functioning of the bank or dune as a natural sediment source and that the average annual erosion rate of the bank or dune is considered in locating such development or redevelopment.
- R.** To ensure that new or expanded public infrastructure does not promote new growth or development in coastal A or V flood zones, on coastal banks, dunes or barrier beaches which could result in damage to the coastal environment, increased storm damage or loss of public recreation resources.
- S.** To ensure that vehicle, boat and pedestrian traffic is managed to protect critical wildlife and plant habitat areas such as wetlands, dunes, shallow estuarine waters and shorebird breeding areas.
- T.** To maintain the safety of posted swimming areas.

- U. To preserve, restore and enhance shellfish and finfish production, shellfish beds, anadromous and catadromous fish runs and other fisheries.
- V. To ensure adequate dredging to maintain existing channels and to improve water flow and environmental conditions in our coastal water bodies.
- W. To ensure the Town's capability to respond to short-term emergencies such as oil spills and life-threatening situations and to develop a plan for dealing with long-term estuary and coastal changes.

Inventory

Flood hazard areas (FEMA A and V zones). There has been a tremendous increase in the last few decades in both the number of persons living in flood-prone coastal areas and in the value of their developed real estate. The Town participates in the National Flood Insurance Program and has adopted a number of zoning by-laws regarding the elevation of new construction and substantial improvements, certification of floodproofing methods, regulation of development in Velocity (V) Zones and regulations regarding manufactured (mobile) homes.

Current regulations limiting construction near coastal areas include the Chapter 91 Waterways Act, Wetlands Protection Act, the new River Protection Act, and the Town's Flood Protection zoning by-law. In addition, as the geographic inventory of the shoreline gets better and more detailed, decision-making capabilities can be enhanced and based on information everyone can clearly see.

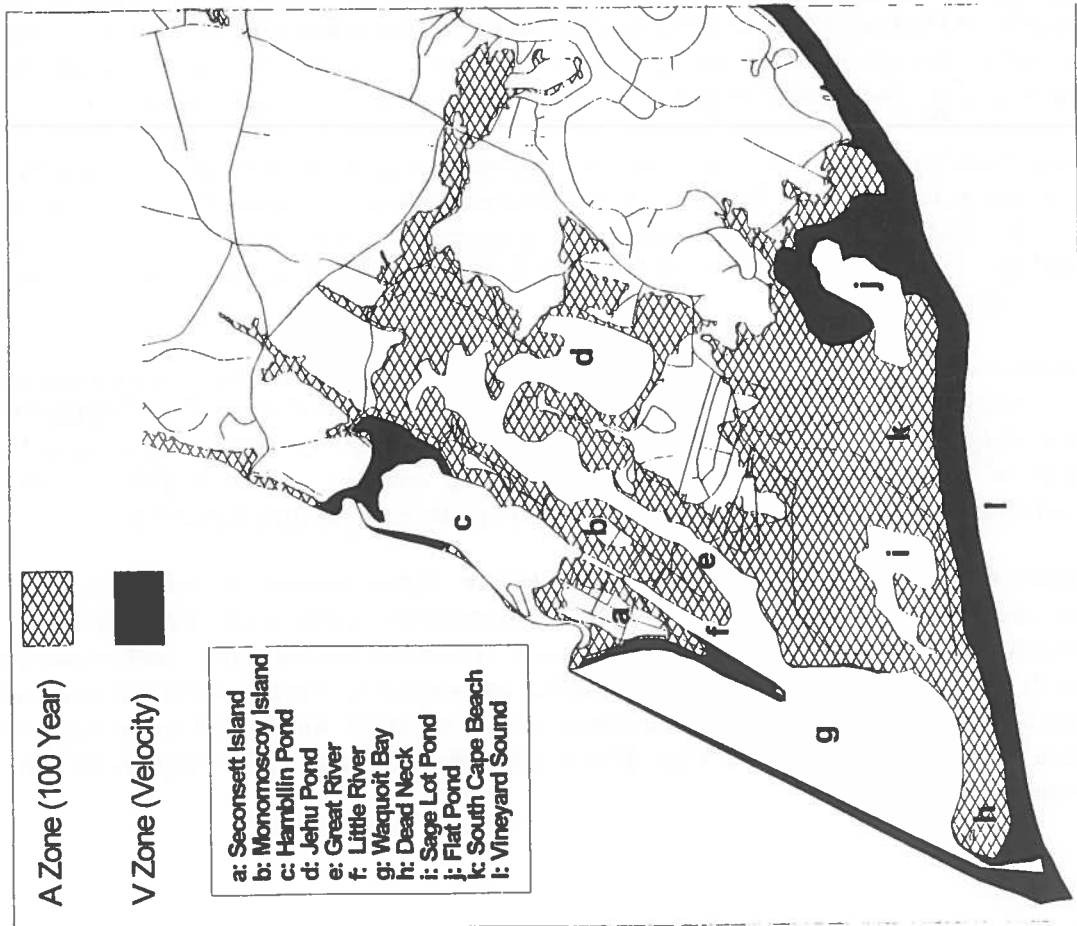
Ongoing and predicted sea level rise, and its effect on the area and severity of flood damage, is a significant long-term issue over which there is considerable debate in the scientific community. A majority of Mashpee's Coastal Resources Management Committee believed that, at this time, there is not enough evidence to justify Town regulations based on a 1 foot rise in sea level, as the Regional Policy Plan suggests. The Planning Board's suggested compromise is reflected in Policy #4.

State Waterways Regulation 310 CMR 9.37 (Engineering and Construction Standards) addresses sea level rise as follows: "new buildings for nonwater-dependent use intended for human occupancy shall be designed and constructed to ... incorporate projected sea level rise during the design life of the buildings... such projections shall be based on historical rates of increase in sea level in New England coastal areas."

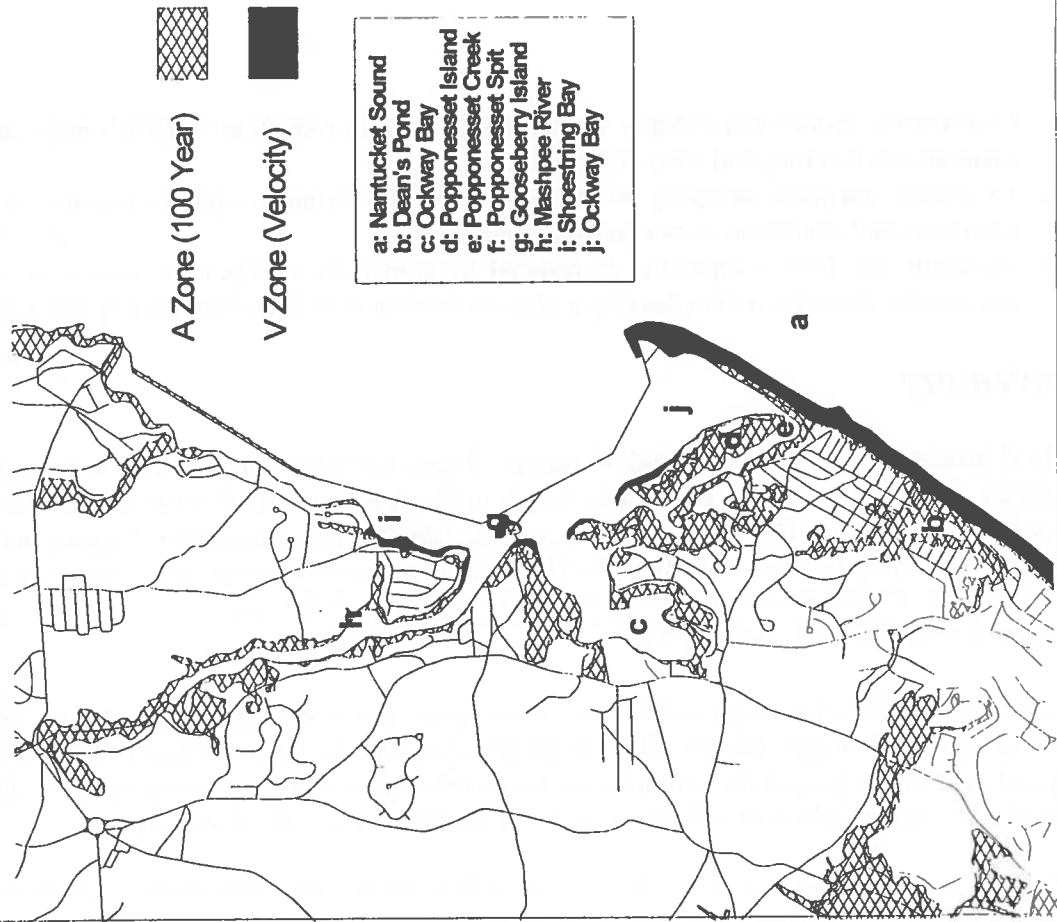
Mashpee was one of three towns included in a *Sea Level Rise Impact Investigation* study prepared by the U.S. Army Corps of Engineers at the request of Massachusetts Coastal Zone Management. The *Sea Level Rise* study suggests "that for planning purposes, it would be appropriate to focus on the 1-2 foot range of sea level rise for practicality when dealing with the short term (30-40 years)," and that a comprehensive resource inventory be developed to prepare for the anticipated rise.

Dunes, barrier beaches and eroding coastal banks. Barrier beaches, including Dead Neck at Waquoit Bay and Popponesset Spit, are narrow, low-lying beaches, connected to the mainland at one end and extending parallel to the general line of the coast. These beaches encompass and protect the estuary and marsh from storm and flooding. Both beaches are subject to wave, current and wind action, causing shifting sands and the erosion and accretion of coastal sands which shift and reshape the sand spits. Dead Neck and adjacent South Cape Beach are publicly owned, while Popponesset Spit has multiple owners.

FEMA A & V Flood Zones



Nantucket Sound, Popponesset Bay and Tributaries



Mashpee's coastal beaches are gently sloping sandy and gravelly or cobbly, extending from low tide to sand dune (or coastal bank) and for 5.23 miles from Dead Neck to Popponesset Spit. They are subject to wave and current action within the intertidal zone, and to shifting winds above high tide level. Coastal beaches (and tidal flats) dissipate the force of waves and of tides, floods and storms and form a sediment source for erosion and deposition along the shoreline.

Coastal dunes, the small expanse of sand dunes formed by wind deposition of beach sand above the back shore on Dead Neck and Washburn Island (in Falmouth) at Waquoit Bay and at Popponesset Spit, are constantly changing in shape and size, though occasionally stabilized by beach grass, beach plum, *rosa rugosa* and bayberry.

Significant eroding coastal banks in Mashpee are found on the southern coastline from Lily Pond to the Tidewatch Condos and in an area between the Maushop Village Condos and houses by the Triton Sound Rotary. An example of less significant coastal erosion is present in a bay front parcel in the Pirates Cove neighborhood.

Significant shellfish habitat areas including areas that are presently closed to shellfishing. Shallow, warm waters, with a sand to mud sediment and the availability of sea grasses (the latter now diminished in both estuaries) provide a desirable habitat for shellfish. Quahogs, bay scallops and soft shell clams are harvested for commercial and recreational purposes. Other shellfish species, such as mussels, whelks, razor clams, and crabs are also present in both bays.

A program of sanitary shoreline surveys (aided by a grant from the U.S. Food & Drug Administration) is directed at possible contributing sources of contaminants. Fecal coliform bacteria was found in high concentrations in road runoff entering the Mashpee River. To correct this situation, catch basins were constructed on Meetinghouse Road to control the road runoff. Catch basins are also planned for the Great Neck Road North and Route 130 Mashpee River crossings.

The three predominant shellfish species of commercial and recreational importance are soft shell clams, quahogs and bay scallops. Oysters, now nearly non-existent within the estuaries, have been commercially grown in shellfish grant areas (farms). Shellfish bed closures have continued at Shoestring Bay and the lower Mashpee River due to elevated bacterial counts. Under the regulations of the state Division of Marine Fisheries, shellfish beds fall into one of the following classifications:

- Approved Area - monitoring indicates low level of fecal coliform bacteria in the water overlying the shellfish bed. The shellfish are suitable for human consumption.
- Conditionally Approved Area - open or closed to the harvest of shellfish for certain periods of time, seasonally or during intermittent or unpredictable pollution events, such as rainfall or combined sewer overflows.
- Conditionally Restricted Area - Shellfish harvested in these areas must be relayed to either a clean site or to a depuration plant to remove pathogens. In many cases, only specially licensed diggers are allowed to harvest from these beds.
- Prohibited Area - closed due to high levels of fecal coliform bacteria.

“Working waterfront” areas = where the predominant type of development is directly related to commercial fishing and shellfishing uses. In Mashpee, the “working waterfront” areas are the estuaries of Popponesset Bay and Waquoit Bay, totaling 1100 acres; marinas and shellfish grants are two important types of development within these areas.

Principal existing uses of the harbor. Both Waquoit and Popponesset Bays invite all kinds of recreational activity by residents and visitors alike. The natural settings of sea, sand, marsh, shrub, dunes, woodlands and numerous inlets invite enjoyment and exploration. Extensive open surface water invites sailing and wind surfing, motor boating, water skiing and jet-skiing, swimming and diving, and recreational and commercial shell and fin fishing.

The Town of Mashpee Waterways By-laws (Chapter 170) and State Boating Regulations place restrictions on the use of surface water, such as setting speed limits and prohibiting water skiing near shore, bathing areas and diving activities. Formal designations for water surface use are aids to navigation (channel markers), swim area markers and speed limit signs. Informally, sailing courses are marked and used within Waquoit Bay by the Waquoit Bay Yacht Club, and Falmouth encourages limiting water skiing to east of Washburn Island.

South Cape Beach and Washburn Island were acquired for recreation and conservation uses by the state during the 1980s, as was a large parcel of land along the Quashnet River. The Town of Mashpee has acquired 250 acres along the tidal portion of the Mashpee River. With the establishment of the Mashpee National Wildlife Refuge, the Town, working with the federal government, the state and the Trust for Public Lands, purchased a 40+ acre parcel with coastal frontage on Jehu Pond.

Seventeen sites have been identified as commercial and recreational water dependent uses of the shoreline. These vary from private to public, developed to undeveloped, and active to passive recreation, and are located in Waquoit Bay, Vineyard Sound or Nantucket Sound and/or Popponesset Bay.

The following summarizes public and large private coastal access facilities in the Town of Mashpee:

Developed Boat Landings. Important public landing and boat launching sites exist on Great River to Waquoit Bay, and at Pirates Cove and Ockway Bay with access to Popponesset Bay. Ramp and parking facilities are available.

Undeveloped Landings. An undeveloped Mashpee Conservation Commission property at Punkhorn Point also provides access to Popponesset Bay. A second undeveloped landing which consists of 0.17 acre of marsh and upland on Hamblin Pond, shown as lots 35 and 36 on Mashpee Assessors Map 120, has 50 feet of frontage on Hamblin Road and approximately 130 feet of frontage on the pond. There is a three car parking lot at this site. The marsh makes it unsuitable for development into an improved boat landing. Undeveloped public access also exists at the Seconsett Island causeway for dinghy launching to the adjacent mooring field and at the north end of Bayview Road.

Canoe Launch Site. A canoe launch site exists on The Trustees of Reservations Mashpee River Woodlands property.

Marinas. Two marina facilities within the Popponesset Bay estuary and one marina within the Waquoit Bay estuary provide up to 100 docking slips, 13 moorings and off-season boat storage for approximately 125 boats.

Beaches. Two public beaches, one owned by the State and the other by the Town, are located adjacent to one another at South Cape Beach. A large private beach exists in the New Seabury/Popponesset development. Sandy Beach, which runs from Dean's Pond to Popponesset Spit., has informal parking across from Dean's Pond and is maintained by the Popponesset Beach Association.

Picnic Areas. The Amos Landing area of the Mashpee River Woodlands has a picnic table, the only coastal area in Mashpee that has one. This plan proposes that additional sites be developed, with the Pirates Cove / Mashpee Neck Town Landing property the first identified for a picnic facility. A grant through Mass. DEM's Coastal Access Facility program is being targeted to improve public access to this site. While at present the DPW Director does not want picnic tables due to maintenance issues, the public might support a budget increase to pay for increased costs.

Other Existing Public Access. A 0.27 acre landing, with approximately 200 feet of frontage on Hamblin Pond, was laid out at the north end of Bayview Road in 1965. The site is marshy, and unsuitable for a developed boat landing. In addition, Riverside Road, with a width of 20 feet, was laid out to the shoreline of Hamblin Pond in 1985. A very steep bank at its end makes it unsuitable for launching boats. The lack of parking precludes it from being used as a waterways access point.

Historic Rights of Way. Traditionally, the woodlands along Mashpee's coast and estuaries were undeveloped, largely in private ownership but generally accessible to residents for access to the coast at almost any point. In addition, "ancient ways" traditionally used by the public, extended to the coast at informal "landings" for access to fishing, shellfishing, hunting and other activities. Historic maps show as many as eight roadways leading to the Sounds, a dozen to Popponesset Bay and its tributaries and at least four to the Waquoit estuary. Rock Landing, Great Field Landing, the Wading Place and Childs' Wharf appear on many maps.

However, as land was subdivided and sold off, subdivision plans often failed to recognize the old roads and landings and the new residents blocked them off, privatized them or built on top of them. A study of Rock Landing Road and Dean's Pond Road, for example, indicates a process of gradual privatization and elimination of what would appear to be traditional public access points to the coast. A 1926 Land Court plan shows both roads extending to Nantucket Sound at Rock Landing and in the area of the Popponesset Inn cottages. In 1938, however, a new plan eliminated both roads as they approached the coast and replaced the Rock Landing access with a more roundabout route via new private streets called Shore Drive and Rock Island Road, while eliminating Dean's Pond Road and apparently replacing its coastal access with a "Way" further up the coast off Shore Drive just north of the Popponesset Inn cottages (the current location of the private New Seabury beach parking lot).

A 1964 Land Court plan shows the subdivision of Rock Island Road into tiny lots, continuing the process of eliminating public access to Rock Landing. The road to the landing was blocked by large boulders, and the landing itself is now listed as belonging to the Rocklanding Park Association, Inc. A 1980 Land Court plan for this area shows an open space easement between Rock Landing parcels and Maushop Village Condos. The question of whether the public has the right to use this "open space" to reach Rock Landing should be researched further. Although proper legal procedures were apparently followed, and current residents of Rock Landing Park and the other subdivisions pay dearly for their coastal land and waterfront access, something has been lost by other residents of the Town and the general public.

Massachusetts Coastal Zone Management has prepared a handbook entitled *"Preserving Historic Rights of Way: A Practical Handbook for Reclaiming Public Access in Massachusetts."* This handbook helps communities preserve "rights-of-way to the sea," including easements, landings, ways, footpaths and trails by defining the different types of rights of way and methods to begin to restore and/or regain public access, or even ownership. It is hoped that through more detailed research and the support of the Town, a number of Mashpee's historic rights-of-way will once again serve the public.

Daniel's Island Road: Town Meeting records for March 4, 1929 state that the "Town voted to survey and layout a road for a Town landing at the end of Daniel's Island Road." The following March, the Town voted to accept Daniel's Island Road and Public Landing as laid out by Selectmen. Historic maps show this road, but a plan showing the layout of the landing is incomplete. Current Assessor's maps show an area that could have been the location of this landing.

Jehu Pond: An historic access point to the southern portion of Jehu Pond was identified in discussions with the Town Planner and Historic Commissioner Frank Hicks. The 1994 Assessor's Map 17 shows an old path or right-of-way coming off Great Oak Road, ending at Tide Run. A 1974 Land Court Plan shows the way running from Great Oak Road to Jehu Pond. The covenant of this property may show what restrictions are applied to the lots that this "way" on these lots. There is also road south of Bayview Condos called Jehu Pond Road, which may be an ancient way leading to Jehu Pond.

Ockway Bay: Two roads were identified leading to the waters of Ockway Bay, both in the New Seabury development. The first is located off Red Brook Road and Great Neck Road, just inside the New Seabury entrance. The Assessor's Map shows a small easement layout from Red Brook to the Bay. The second is an identified road leading to Pocknett Neck off Daniel's Island Road. A recent Assessor's Map shows a subdivision road named Sand Dollar Lane running down to the Ockway Bay, which closely matches the estimated 1940 location. A possible historic landing off Pocknett Neck should be researched.

Mitchell's Landing: The end of Simon's Narrows Road onto Shoestring Bay is historically known as Mitchell's Landing. During World War II, the federal government took this property for military use. Assessor's Maps in the early 1980's show this landing as part of the right-of-way. Today, this landing is listed as a separate parcel owned by William Cuming, classified as "recreation" by the State Land Use code. The "prescriptive" rights of the public to use this landing should be researched further.

Additional historic rights-of-way include a road entitled "McGregor's" which led to the Little Flat Pond area, now part of the New Seabury Golf Course, and roads on Seconsett and Monomoscoy Islands. The status of this and other historic rights-of-way should be investigated further. The Historical Commission maintains a file of historic maps as well as past Town Meeting action for the layout of roads and landings, while the Planning Department has old subdivision plans, including Land Court plans, which can help identifying the historic rights-of-way as well.

Analysis

Coastal resources that may be environmentally sensitive to development and/or overuse and should be protected. Mashpee's embayments (Waquoit and Popponesset Bays and associated Bays/Rivers/Ponds), at the interface of land and sea, are referred to as estuaries. Estuaries are intrinsically fragile ecosystems. Their shallow waters, warmed by the sun and constantly mixed by tides and currents which stir in nutrient-rich sediments, are some of the most productive on Earth, supporting myriad species during critical times in their life cycles. Tidal exchange (or flushing) is limited by the narrow inlets to these bay systems, so the nutrients leached from the respective watersheds are not diluted as much as would be desirable.

The health of these water bodies impacts Mashpee's economic well-being. Direct impacts are seen in shellfishing, particularly in the funds received by the Town for commercial and family shellfish permits. In FY 1997, the Town received \$7,887 from shellfish permits. Indirectly, their health affects waterfronts

property values and the number of visitors who come to Mashpee looking to swim. (Poorer water quality = fewer visitors = fewer customers for lodging and dining establishments). Nantucket and Vineyard Sounds are a little less sensitive, but these waters should be protected as well.

The two public beaches within the Town, the State and Town South Cape Beach, are heavily used. During peak summer days, the Town parking lot fills up, a situation that has existed for years. The Town can not expand its parking lot. People can pay \$2 to park in the State parking area, if it is not filled as it often is during peak summer weekends. There are 200 parking spaces now at the State lot, with up to 400 allowed under the current agreement between the State and Town for management of South Cape Beach.

The Harbormaster has identified the Ockway Bay Town Landing facility as underused, because there is no deep water in Ockway Bay, and it is remote from the rest of Popponesset Bay. Unless this area is dredged and a "Planing Channel" established, the ramp will always see little use.

The Town recently took ownership of a 10-acre parcel of land at the end of Will's Work Road, on the mouth of the Great River. A marina was proposed, but development of such a facility is problematic due to its shallow water frontage, suitable only for launching dinghies, kayaks and canoes, the productivity of the area for shellfish, and Monomoscoy and Seconsett Island resident opposition to marina development at that site due to the undesirable characteristics of a commercial operation in a residential district.

Conversion of shorefront property from water dependent to non-water dependent uses, and losses or gains of public access to the shoreline. One example of the trend of conversion to non-water dependent use and subsequent loss of public access to the shoreline is the 11-lot Harbor Ridge subdivision approved by the Planning Board in 1996. Although the property had been in private hands before approval, it lies within the Mashpee National Wildlife Refuge. Any opportunities for a coastal trail or other passive recreational uses along this portion of Ockway Bay are most likely lost.

The Saltzer property on Whippoorwill Circle was determined by the Town to be "unbuildable," since no well and septic system could be located on the property. The owner sued the Town in Land Court, but lost, and subsequently gave his property to the Town. This property, which has access to the Great River, has the potential for public access to the water, but due to a coastal bank fronting on Great River, does not appear suitable for a boat launching site. If further research indicates such development is not feasible, it might serve as overflow parking for the Great River Boat Ramp, as a picnic/scenic view area, or a public way to water. Residents and neighbors often oppose the development of public access uses to the water and this case is no different.

As Mashpee has become rapidly developed, traditional public access to the coast and the potential for creating new points of public access have been reduced. At the same time, however, public acquisition and funding for improvements have increased formal coastal access in certain areas and made boater access to the bays easier. Potentially, South Cape Beach greatly increases public access, but there has been a policy of locking the gates to prevent the public from using the Will's Work Road area, and other areas. The State Public Access Board (part of the Department of Fisheries, Wildlife & Environmental Law Enforcement) has refused to get involved in this issue because South Cape Beach State Park is managed by the Department of Environmental Management, another state agency with different rules.

Within the last 30 years, however, significant land acquisitions have resulted in public ownership of portions of the coast. In 1964, the Town acquired its beach at South Cape as part of the original New Seabury approval process. In 1963, Fields Point Manufacturing Company also deeded a strip of land off

Great Oak Road to the Town which allowed the creation of the Great River Town Landing. 1981 saw the biggest increase in public access with the state's purchase of South Cape Beach State Park. In 1985, 1986 and 1987 the Town purchased the Mashpee River Woodlands, with \$3 million of state Self-help funding, \$325,000 in federal Land & Water Conservation Fund monies, approximately \$100,000 in private fundraising and \$2.7 million in Town funds. Meanwhile, the Great River, Ockway Bay and Pirates Cove Town Landings completed new ramps and parking facilities in 1986 with the assistance of CZM funds.

Since the 1990 *Coastal Resources* plan, the Town, working with Falmouth, the State and the U.S. Fish and Wildlife Service, has created the Mashpee National Wildlife Refuge. One large parcel of 325 acres, known as the Bufflehead Bay property, includes 75 acres of wetlands with over 9,000 feet of waterfront frontage along Jehu Pond and Great River. At October 1996 Annual Town Meeting residents voted to appropriate \$250,000 towards the purchase of the entire Bufflehead Bay Limited Partnership property with the majority of other funds coming from the U.S. Fish and Wildlife Service.

Other public access losses or gains include the closing of Homeyer's marina on Monomoscoy Rd, the Town turning down the South Cape Beach trade, and the acquisition of the 10 acres off Will's Work Road. Also a Town Dock and Harbormaster Building have been scheduled for Town-owned property adjacent to the Little River Boat Yard. The residents of Seconsett Island have registered strong opposition to any public access associated with developing the Town landing that was laid out in 1962. When surveyed by the engineer hired to prepare the plans and obtain permits, the Town-owned lot next to Little River Boat yard turned out to be 80' by 65' rather than 96' by 80' as shown on various plans. This building is scheduled to go here, but a 12' overhanging porch, may have to be eliminated.

Conflicts among various users of shorefront facilities and harbors:

Shellfishing with mooring sites. This conflict has been managed effectively by cooperation between the Harbormaster and the Shellfish Constable. Moorings in shellfish areas are located to avoid negative impacts on shellfish.

Waterfront property owners with Conservation Commission. Many waterfront property owners believe in their rights to clear their land down to the water to provide access to their docks and a clear view of the water. However, clearing leads to loss of habitat along the shoreline. Any person with property within 100 feet of any resource covered by the 310 CMR Wetlands Protection Act is subject to the Conservation Bylaws (Chapter 172). In addition, the Rivers Protection Act increases this jurisdiction up to 200' feet along "any natural flowing body of water that empties to any ocean, lake, or other river and which flows throughout the year."

Waterfront property owners and their docks with shellfishing. Regulation of docks, including location, height and clearance, falls under MGL Chapter 91. In Massachusetts, the "intertidal area," between the mean high tide and mean low tide line, can be privately owned, as determined by the Courts since the 1640's, and are open to the public only for "fishing, fowling and navigating."

These provisions are ancillary to our Wetlands By-law, Chapter 172, which provides that "recreation, shellfish and fisheries" are within the Conservation Commission's "control of activities." The Commission determines whether each permit application is "likely to have significant or cumulative effect upon wetland values."

Waterfront property owners have expressed concern about boating and shellfishing impacting the shoreline and creating turbid conditions. As regulations affecting the coastline are developed, they

would like to see consistency in management of the various harbor users.

Shellfish farming (grants) vs. other uses of the water. Some concerns with future farms are potential conflicts with boaters, swimmers and recreational fisherman. The Aquaculture section in the Action plan discusses steps to try to accommodate all users, including potential aquaculture operations.

Adequacy of existing commercial and recreational shoreline facilities to meet current and projected needs of water-dependent commercial and recreational uses. Mashpee was the fastest growing town in the Commonwealth during the last 1980's, and continues to be in the top ten. Since much of the development is related to summer recreational opportunities, the demand for boating, swimming, fishing, water skiing, jet-skiing, sailing, sail boarding, shellfishing and other activities, and their related facilities, has grown tremendously.

The Town's year-round population has increased from 3,700 in 1980 (U.S. Census) to 9,108 in 1996 (Planning Dept. estimate). The number of dwellings has increased from 3,582 in 1980 to 7,979 in mid-1996. Meanwhile, estimated summer population, reflecting the seasonal recreation-oriented nature of the town, has increased from 13,481 in 1980 (CCPEDC estimate) to 25,554 in 1996 (Planning Department estimate). Half of the Town's dwelling units are only occupied during the warmer months, with many of those used only for a few weeks in July and August or as weekend getaways.

This growth in population brings with it a rapid increase in demand for water-related recreational activities. A number of sources, of varying accuracy and length of record keeping, illustrate this growth:

Shellfishing Shellfish Permits have increased steadily over the years, particularly between 1960 and 1980, but have stabilized during the 1990's. Receipts are totaled by fiscal year, while permits are recorded by calendar year. The amount collected in FY96 and FY97 show a decline in permit revenue from FY95.

Beachcombing Records on beachgoers in Mashpee are difficult to come by. The Town first began to charge for parking at South Cape Beach in 1970. In 1974, a system of resident beach stickers was established. 1996 saw the sale of 2,100 resident beach stickers, 180 guest passes and 112 timeshare condo passes at \$49,370. Table 3 highlights the growth in revenue collected from beach stickers.

Table 3: Dollars collected for beach stickers

	1970	1974	1979	1990	1996
\$ amount collected	\$1,878	\$2,387	\$5,010	\$37,215	\$49,370

Boating Boating has shown a much more significant growth rate in recent years. The Annual Report of the Harbormaster has listed since 1976 (although permits were first required in 1972) the number of registered moorings. This growth in mooring permits is shown in Table 4. These numbers include moorings and floats in both freshwater and saltwater. Revenue information for mooring permits has been provided where available. In 1996, 523 of the 630 moorings were in saltwater. Table 5 shows the distribution of saltwater mooring sites based on the 1996 numbers.

Table 4: Mooring Permits (Both Freshwater and Saltwater)

	1976	1981	1986	1988	1989	1995	1996
# of Mooring Permits	102	200	360	720	650	630	630
\$ amount collected	n.a.	n.a.	n.a.	\$11,361	n.a.	\$23,593	\$25,616

The apparent reduction in recent years has been primarily due to stricter enforcement of mooring permit requirements, as well as to the early '90s economic downturn. However, with the town's tremendous growth potential, demand for moorings is certain to increase greatly in the future. Future mooring fields, however, will be in limited supply. According to the Harbormaster, only a small number of areas can be developed as new fields and in other locations, just a few individual mooring sites can be added.

Areas where a few individual sites could be added include: north of Mitchell's Landing in Shoestring Bay, further south towards South Cape Beach in the Waquoit Bay fields, a few new sites within the Great River, and a few other isolated locations. The northern portions of Jehu and Hamblin's Ponds offer some potential for new fields, although parking and public access would need to be addressed. A dinghy dock could be developed at the recently acquired Will's Work Road 10-acre site to provide improved access to the Waquoit Bay mooring fields.

Table 5: Distribution of Saltwater Moorings in 1996

Waquoit Bay	106
Little River	11
Hamblin Pond	43
Lower Great River	49
Middle Great River	32
Upper Great River	48
Jehu Pond	50
Waquoit Bay Total	339
Popponesset Bay	29
Popponesset Creek	17
Popponesset Bridge	17
Ockway Bay	29
Daniel's Island	8
Mashpee River	25
Shoestring Bay	16
Half-Tide Marina	11
Pirate's Cove	32
Popponesset Bay Total	184
Total Saltwater Moorings	523

Under the provisions of Chapter 60B of Massachusetts General Laws, any motorized boat over 16 feet is assessed for excise taxes. According to Mashpee Assessors' records, there were 167 such boats in Mashpee in fiscal year 1980. That number had increased to 333 in 1985, 660 in 1989, and stands at 891, an increase of 434% over the 1980 figure. While smaller boats are not covered by these figures, and the replacement of smaller boats with newer, larger and more expensive boats may account for an overstatement of the actual growth in total numbers of boats in the Town, the trend is, again, quite clear.

As the Town continues to develop, less land will be left vacant (other than protected open space). The projected needs for 2004 and Buildout are such that recreation demand is going up, but there is no more space to develop new public beach facilities. More facilities could be added to the existing beach front to provide access for more people, but must be approved by the State for its facility and the Town for its

facility. The South Cape Beach agreement limits the amount of parking to “no more than 400 vehicles,” where 200 are now provided. For public access and “sea path” projects, there is still some potential.

Identified Dredging Needs. The demand for maintenance dredging is obvious at the entrance to Popponesset Bay, where the very dynamic movement of Popponesset Spit and the sands which replenish it make the maintenance of a deep channel an difficult and expensive task. According to both historical and current sources, there is a rather deep channel at the actual mouth of the bay, but much shallower "deltas" of sand and gravel both inside and outside that entrance. Soundings done for the state's Board of Harbor and Land Commissioners at low water on July 12, 1893 show depths of 4.2 to 12.4 feet in the channel between the end of the Spit and Meadow Point in Cotuit, while channel depths decrease to a low of 2.6 feet inside the bay and 3.8 feet just outside the bay. The natural channel in the bay heads north from Thatch Island toward Shoestring Bay.

While Popponesset Spit has been reduced spectacularly in length since 1893, the scouring action of tides flushing into and out of the bay has continued to naturally maintain a deep channel of 13 feet or more at the bay's immediate entrance area, while the "delta" effect seems to have become even more pronounced. Immediately inside the bay depths were only 3.5 feet in the two channels now existing prior to recent dredging, while a large sand shoal had built up between the two and continues to expand. Outside the bay entrance, channel depth was reduced to two feet within a broad, shallower delta.

Public (and large Private) Dredge Projects Since 1960

Year	Stretch of Dredged Channel	Spoil Disposal Location
1962	Popponesset Creek, Spinnaker Cove & other small tidal creeks and marshes	Adjacent marshes
1984	between the Waquoit Bay channel & the lower end of the Great & Little Rivers	Tip of Seconssett Island
1987	entrance to Popponesset Bay to the man made New Seabury Channel	Popponesset Spit
1987	Outside Popponesset Bay natural channel out to Nantucket Sound	Popponesset Spit
1997	Maintenance dredging of those projects done in 1984 & 1987	Tip of Seconssett Island & Popponesset Spit

The other significant problem in maintaining access to the man-made channels of Popponesset Creek is, as noted earlier, the shallow areas on either end of the entrance to the Bay. It was not long after the creation of the new channel behind the Spit that it became apparent that, unless frequent maintenance dredging was done or some massive structural solution was constructed, the deep water boating promised by the Popponesset Creek channels was just an expensive illusion.

An alternative channel has been proposed that would begin at the southern tip of Popponesset Island and run along the current relatively deep eastern shore to the existing cross bay channel. The bridge over Popponesset Creek was recently rebuilt with a clearance height of 4-5 feet, but this channel should still be considered during the development of the Master Dredging Plan.

The Mashpee River has filled with black muck to the point where water quality is degraded and navigation is restricted to very shallow draft watercraft. Dredging can improve the flushing rate and improve the navigation, but dredging the Mashpee River alone is unlikely to increase the flushing rate as desired. For better flushing to occur, the water depth should continually increase from the upper reaches of the Mashpee River to Nantucket Sound.

Ockway Bay has also filled with black muck, and has very little water at low tide (preventing a Harbormaster Building and Town Dock at the Ockway Bay Town Landing property). The Coast Guard will no longer allow the placement of navigation aids to define a channel because of the shallow depth.

Within the Waquoit Bay system, dredging is more problematic, as the area has been designated an Area of Critical Environmental Concern (ACEC). The previously dredged channels in Waquoit Bay and the Little and Great Rivers are excluded from a provision that prohibits dredging. Other waterways of this estuary, including Jehu Pond, Hamblin Pond and those areas of Little and Great Rivers and Waquoit Bay proper that are not previously dredged channels will not be dredged because of the ACEC designation.

There are at least 18 agencies involved in the dredging permitting process. The avoidance of spawning and breeding periods, alertness to sensitive habitats and organisms and local currents and the avoidance of the displacement of exceptionally productive benthic and sediment-dwelling organisms are some of the items these agencies take into account during the permitting process. Dredging can offer potential benefits to marine life and water quality from increased flushing, as well as the benefits to improved and maintained navigation, but cost/benefit ratios be seriously considered, along with sources of funding and the allocation of costs among the various users of the Town's waterways.

Currently Identified Dredging Plans/Funding Options. The 1990 *Coastal Resources Plan* stated that "the Town will have to look seriously at the cost of such dredging, how and by whom will it be managed, and what is a fair distribution of costs between waterfront property owners, boaters, other Town residents and outside revenue sources, such as the state's Rivers and Harbors Program." The Mashpee Waterways Improvement and Maintenance Fund, revised by an act of the State Legislature (Chapter 269 of 1996) now receives its funds from the following sources:

- a) 50% of excise taxes collected on boats greater than 16 feet
- b) Mooring registration fees
- c) Other monies appropriated to said fund by the Town or State
- d) Any donation or gift to said fund.

Since excise taxes are based on where a boat is "habitually moored," and Mashpee has a significant seasonal population, the Town does not get all the potential dollars from boaters using our waters. To increase funds available for dredging, the Town, with state approval, may wish to allocate all of these funds to the Waterways Improvement Account, versus 50% going into the general fund. Other sources of funding should still be considered, particularly non-property tax based sources. A concerned waterfront property owners group, Save Popponesset Bay, helped fund the 1993 emergency dredging of Popponesset Creek. It should be noted that contributions to the Town for public purposes are tax deductible.

Public comments on the first draft of this plan addressed charges to boaters in Mashpee waters who do not pay mooring fees. Dock owners do pay a separate assessment for their docks, but these funds go into the general fund, not into the Waterways Improvement Account. Could such funds be shifted into the Account? Those users of Mashpee's waterways who do not contribute include transient boaters who use the public boat ramps, operators of boats not required to be registered (canoes, kayaks and non-powered boats), and powered boats under 16 feet in length. The Town could consider the institution of ramp fees, but there is question of whether or not that would produce a net gain in revenue after the expense of paying the ramp attendants. The Town should find a mechanism for all boaters to pay their fair share.

Funds for engineering work to obtain permits to maintenance dredge the Waquoit Bay and Popponesset Bay areas were allocated in the October 1995 Town Meeting. In the October 1996 Town Meeting, up to

\$95,000 was approved to conduct the maintenance dredging and post dredging survey work which was completed in Spring 1997. The Town used the County Dredge program, which in 1997 cost \$4.14 per yard, for the maintenance dredging. These services included the cost of pre-dredge and post-dredge surveys that are required. The County Dredge Program is funded by the Department of Environmental Management, Waterways Division, under the River and Harbors Act.

A comprehensive program for identifying, funding or conducting channel dredging is now underway by the Waterways Commission. Such a program is one step closer now that Town Meeting voted to appropriate and transfer \$85,000 to the Waterways Improvement Account to be spent as the Board of Selectmen see fit, to analyze the Popponesset Bay System, with priority on getting permits to dredge the Mashpee River. The intent is to gather all pertinent data about the Popponesset Bay system so that as one embayment is dredged, others are not adversely affected.

The Waterways Improvement Plan deals with all Mashpee waterways, and includes more than just dredging, e.g. the Spit. Dredging priority is given to the Mashpee River, followed by Ockway Bay, then others as the need is identified. The draft Plan called for investigating the flushing of the Popponesset Bay system under several different dredging channel configuration scenarios, spot checking the condition of the sediments for contamination, and performing bathymetric surveys of the Bay and its tributaries, to support development of a channel design that would improve water quality and enhance navigation.

Because of the complexity of the multi-agency permitting process and the expense of consulting services, the Town has elected to do as much of the necessary work as it can, to reduce cost of the expensive engineering services required to apply for the permits.

The Waterways Commission contracted with Aubrey Consulting Incorporated to predict the tidal flushing that would result from dredging segments of the Mashpee River, a main channel in Popponesset Bay, and the formerly dredged channels in Popponesset Bay. The analysis showed that 8.5 to 12 percent improvement in flushing of the Mashpee River would result, and that dredging the channel parallel to Popponesset Spit would have negligible adverse effect on the flushing action in the Mashpee River.

The Harbormaster, Shellfish Constable, and two Waterways Commissioners took spot samples of the Mashpee River sediments and had them analyzed to see if sediments were contaminated with hydrocarbons, heavy metals, etc. Such sediments are difficult to dispose of, and the cost of disposal rises considerably if there is contamination. Fortunately, the results showed no contamination.

In February of 1997, Aubrey Consulting set tide gauges in Nantucket Sound, Popponesset Bay, Ockway Bay, Mashpee River, and Shoestring Bay to measure the effects on the tributaries of performing the maintenance dredging. Unfortunately, the gauges in Popponesset Bay and Shoestring Bay failed, but analysis of data gathered shows that the tide rose a few inches higher in both Ockway Bay and the Mashpee River, and high tide levels were reached a few minutes earlier than before the dredging. Flushing was improved, but the extent could not be quantified through a numerical analysis model.

In the spring of 1997, the Harbormaster, and the Waterways Commission, provided several tours of the Popponesset Bay system to MA Coastal Zone Management, U.S. Army Corps of Engineers, Massachusetts Department of Marine Fisheries, Waquoit Bay National Estuarine Research Reserve, Dr. Joseph Costa of the Buzzards Bay project, and Dr. Ivan Valiela of the Marine Biological Laboratory. They proposed disposing the dredged materials in the tributaries to improve the flushing activity, and eventually presented to ideas to the Army Corps of Engineers in May of 1997 for their guidance. In June

of 1997, the Army Corps of Engineers responded to the Waterways Commission that dredging could not be allowed, given the data provided so far.

The EPA and Marine Fisheries responded that there was no substantive proof that the predicted small increase in flushing would improve water quality; that they did not want any spoils against the marsh edge; that side casting of the dredged material would cause large turbidity plumes leading to bad water quality; that possible annual dredging would lead to an overall net loss of water quality; that a full assessment of nutrient and pollution loading from septic systems, fertilizers, waterfowl, etc., and an analysis of other natural biological and geochemical processes were required; and that, in summary, dredging was currently not favored because of the negative impact.

In the summer of 1997, Wayne Jaedtke, supervisor of the County Dredge, aided by three Waterways Commissioners, used the County's Global Positioning Satellite (GPS) system and depth finder equipment to perform a bathymetric survey of Popponesset Bay, Ockway Bay, Mashpee River, and Shoestring Bay. These data were used to prepare a preliminary design of five channel segments in the Mashpee River to be used as scenarios for running the flushing analysis model dredging.

The newly formed Mashpee Watershed Management Committee arranged with Dr. Brian Howes, (Senior Fellow of the Center for Marine Science and Technology (CMAST), University of Massachusetts, Dartmouth, Mass) to conduct a short term analysis to assess the water quality in the Popponesset Bay and in particular to determine if the system suffers from a lack of oxygen, and to assess the nutrient levels. CMAST personnel set automated test devices in the Mashpee River, Ockway Bay, Shoestring Bay and Popponesset Bay to take measurements. To supplement this information, for five weeks during August and early September, volunteers from Mashpee and Cotuit sampled the water and measured temperature and salinity and provided it to the CMAST laboratory.

The results of this effort showed that the upper reaches of the Mashpee River are the most stressed, and frequently have no oxygen. Nutrient levels are also far in excess of what is considered to be a healthy amount. This study confirms the need for taking action to improve the water quality in the river. The Army Corps of Engineers require a full year analysis of the system, and development of a nitrogen budget. Brian Howes of CMAST has offered to conduct this study if the Town is willing to support it financially. It is possible that some funding can be obtained through a grant from Mass DEP.

Problems, including poor water quality, that may have an adverse effect on the use of harbors and shoreline areas. Waquoit Bay and Popponesset Bay and their tributaries are shallow and becoming eutrophic. All are facing pollution by excess nutrients, and are subject to sediments being stirred up by storms, boats, and shellfishermen. It is thought that low light levels due to suspended sediments and growths of algae contribute to the loss of eelgrass. The stirred up sediments also are thought to release nutrients that contribute to algae growth.

On the other hand, some people contend that there may be some benefit to stirring up the sediments. On an outgoing tide on a busy summer weekend, the plume of sediment being flushed out of Waquoit Bay is readily visible from the air. Also, Karl Rask, formerly of the University of Massachusetts County Extension wrote a paper discussing the effects of shellfishing practices on the shellfish habitat. This document argues that there is a beneficial aspect to oxygenating the sediments by stirring them up, much like tilling a garden. Dr. Richard Crawford from WBNERR conducted a study for Waquoit Bay which measured suspended sediments from boats. He found that sediments stirred up by boats settled out quite rapidly, and did not persist long enough to adversely affect eel grass.

Popponesset Bay: Popponesset Bay in general has several problems, including an eroding barrier spit, poor water quality due to excess nutrient, a loss of eelgrass, loss shellfish populations (oysters and scallops) and shallow navigational channels.

Excess nutrients in Popponesset Bay are thought to cause large amounts of algae growth (both phytoplankton that make the water cloudy, and macroalgae or seaweed). Scientists contend that the lack of light due to the cloudy water has contributed to the decline in eelgrass that serves as a protective area for developing finfish and shellfish.

Popponesset Bay itself has fairly good flushing action, but the tributaries, in particular the Mashpee River, do not flush as well. It is important to keep the mouth of the bay a free flowing channel that can pass water in and out rapidly thus enhancing flushing of the tributaries.

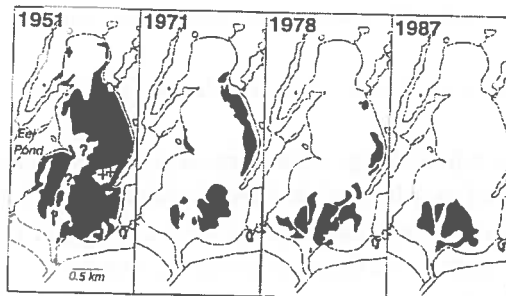
The Mashpee River: The Mashpee River has a number of problems associated with it. There are odors, black muck sediments, shellfish closures, and poor flushing. The shellfish closures are due to high counts of coliform bacteria. According to a Cape Cod Commission Study, Nitrogen concentrations in the Mashpee River exceed critical limits many times over.

The river waters contain nutrients that cause excessive growth of algae and other aquatic vegetation. The river is long and narrow with a small daily tidal ebb and flow in the brackish section that does not allow a good flushing action. The tidal current is too slow to prevent accumulation of sediments and decaying plant life in suspension as the tide ebbs and flows. Due to the lack of flushing action, a thick layer of muck has accumulated on the bottom further restricting the depth and water flow. Even with dredging, flushing along will not bring the nutrient concentrations down to acceptable levels.

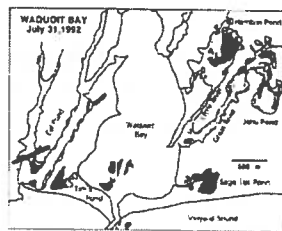
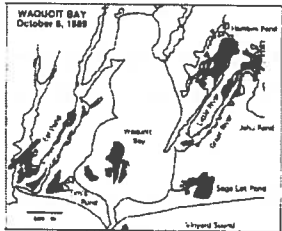
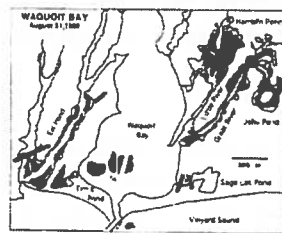
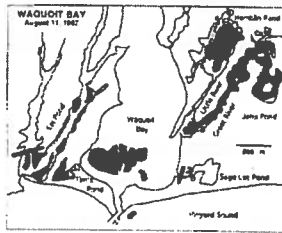
Ockway Bay: Ockway Bay is very shallow with a bottom characterized as “black muck,” so shallow that the U.S. Coast Guard does not allow placement of Navigational Aids. The Bay does not appear to have a coliform bacteria pollution problem as does the Mashpee River, but does show signs of excess nutrients.

Shoestring Bay: Like the Mashpee River, Shoestring Bay suffers from a bottom filled with black muck and is often closed to shellfishing due to coliform bacteria pollution. Although it is a narrow body of water, there is better flushing action so the nutrient concentration is not as high as the Mashpee River. In the summer of 1996, the Bay experienced the worst algae bloom that Cotuit residents could recall.

Waquoit Bay: Like many shallow coastal embayments the Waquoit Bay estuarine complex shows many common signs of an increased supply of nitrogen: decreased water clarity (turbidity), overgrowth of phytoplankton and seaweeds at the expense of seagrasses, decreased dissolved oxygen in bottom waters, increase incidence of fish kills and changes in benthic community composition.



Source: Costa, et. al. 1991. Reprinted with permission of Elsevier Science Ltd.



Once found throughout Waquoit Bay, eelgrass in the deeper parts of the Bay began to disappear after 1965, and by the mid-1970's was no longer found in shallow areas. Today, eelgrass has disappeared from the lower Bay, and is found only at the tidal inlet near the mouth of the Eel Pond adjacent to Washburn Island, in the small salt pond and salt marshes of Washburn Island (Falmouth), and in patches in Jehu and Hamblin Ponds. All of these areas are fairly undisturbed sites that are either well flushed, too shallow for boat traffic, or protected in other ways.

The pattern of eelgrass decline is attributed to development that has increased the supply of nutrients to Waquoit Bay. Increased nutrients have promoted the growth of different algae species, which shade the benthos and effectively outcompete eelgrass. Short et al. (1992) attributes eelgrass decline in different parts of the Waquoit Bay system to the presence of epiphytes in Eel Pond, macroalgal blooms in Hamblin Pond and phytoplankton blooms in Great River and Jehu Pond. Sediment resuspension, from boating activities in the central Bay and wind in the eastern Bay, may contribute to reduced light.

Hamblin Pond used to be heavily populated with eelgrass, but now has thick layers of algae on most of the bottom, and phytoplankton blooms make the visibility about a foot in the summertime. Only a little eelgrass still grows, mostly in the northern portions of the pond. A culvert under the Monomoscoy Road culvert connects Hamblin Pond with the upper reaches of Great River. There is very little flow due to collapsed road material, and there is a strong odor at low tide.

Little River tends to remain well flushed due to strong currents flowing to and from Hamblin Pond. Shoaling where the river enters Hamblin Pond is the most significant problem.

Great River has fairly good tidal flow, but during the summer algae covers the tidal flats, and the numerous eelgrass beds are gone. Thick black muck lies between the channel and the shores.

Jehu Pond suffers also from algae mats, and there is very little eelgrass remaining.

Upper Great River/Abigail's Brook: The main problem in this area is the dwindling eelgrass.

Areas where large numbers of private docks and piers have limited access along the shoreline or resulted in a loss of shellfish habitat. The WBNERR 1992 *Recreational Boating Survey* identified 128 docks in the Mashpee portion of the Waquoit Bay estuary. A map produced from this study shows Little River with 44 of the 128 docks, or about 1/3. The Little River Boat Yard has about a dozen of these 44. Access for shellfishing has been limited and there has been a small loss of habitat.

For the Popponesset Bay estuary, aerial photos were used to estimate of the number of docks located along the Mashpee waterfront portion. Approximately 175 docks were in these waters as of March 1993. About 40%, or 72 docks, were with the Popponesset Creek and associated dredged marshes. With those

in the New Seabury Marina, the number approaches 60%, or 101. The Popponesset Creek area appears to be the only part where access has been extremely limited, affecting shellfishing opportunities. There is a smaller cluster of docks in the Pirates Cove area fronting the Mashpee River and at Half-Tide Marina.

Older docks not subject to the Chapter 91 public access provision account for most limited access areas. These docks were built level to provide direct access for the homeowner, blocking travel for fishing, fowling & navigation. According to aerial photos from 1974, the Little River and a portion of Great River may be areas where lateral movement has been restricted. 1980 photos of the Popponesset Bay system show docks in the Popponesset Creek and around Popponesset Island, and in 1984, docks were identified along the southern shore of Ockway Bay. New docks must be built high enough (5' clearance), or stairs must be constructed, to allow access for fishing, fowling & navigation by the general public.

Development in high hazard areas and needed regulations to minimize further hazards. The Federal Emergency Management Agency (FEMA) flood maps for Mashpee indicate that there is significant existing development in flood hazard areas (A & V zones). Within the Waquoit Bay estuary, the majority of Seconsett and Monomoscoy Islands, as well as portions of the South Cape Beach, Quail Hollow and Little Neck Bay subdivisions, fall within A zones. The western shore of Seconsett Island lies in a V zone. In the Popponesset Bay estuary and along the Nantucket Sound facing coastline, properties around Dean's Pond, on Daniel's Island and along Popponesset Creek, in addition to a significant portion of Popponesset Island, lie inside A Zones.

In addition to Mashpee's existing set of floodplain regulations, the state Coastal Zone Management (CZM) office has drafted a set of regulations for dealing with coastal flood zones, especially regarding construction of buildings in A & V zones. Many of the Cape Cod Commission's Minimum Performance Standards are based on the CZM regulations. These have not been implemented by the state. Federal flood zone regulations for A zones include the requirements that new residential construction and substantial improvements must have their lowest floors at or above the base flood elevation (BFE), which is also a State Building Code requirement under 780 CMR 2102.00, and that all structural and nonstructural building materials at or below the BFE must be flood resistant.

The community, in deciding how to regulate building in the floodplain, must be aware that not all of Mashpee's proposed policies for flood zones are consistent with the Regional Policy Plan. Among the options available to the Town are to continue with our current set of floodplain regulations, adopt the Commission's standards (e.g. the State CZM guidelines), or work out a compromise. It should be noted that the Commission's standards would not apply to existing buildings, but only to new construction and substantial improvements (defined as any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value before the start of construction of the improvement). This Plan includes a policy which would increase the base floor elevation by one foot within A & V zones. The base floor elevation is used in determining for the lowest floor elevation in residential structures and for floodproofing in nonresidential structure.

Owners of properties within these flood zones are now required to purchase FEMA flood insurance, and as of 1994, mortgage lenders must notify potential and existing borrowers of this requirement. The lender may purchase the flood insurance and charge appropriate premiums and fees to the owners.

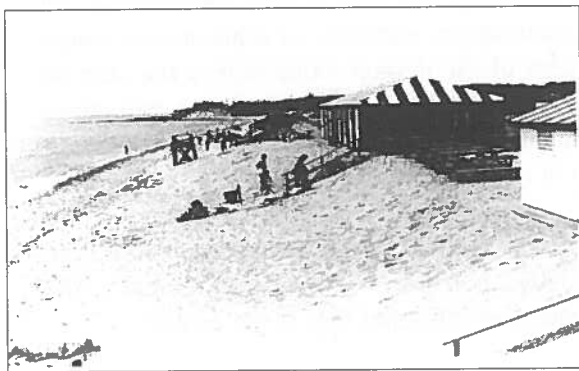
There are a number of other regulations affecting properties in coastal flood zones. These include the Town's existing floodplain regulations, the State's Chapter 91 Waterways Act and associated regulations (310 CMR 9.00), Title V, and the State's Wetlands Protection Act (including associated buffers provided by this Act and the recently passed Rivers Protection Act) and associated regulations (310 CMR 10.00), the State Building Code and federal regulations. Except for those pertaining to the recommended policies, including the compromise suggested by the Planning Board, this Plan does not recommend any new regulations. The Town will continue to enforce what is on the books, apply for the National Flood Insurance Program's Community Rating System and study the issue of regulations of development within the flood zones further. A resource-based wetlands buffer, which is still being developed by the scientific community, should be considered when a sufficient and agreeable set is developed.

The Town is conducting a geographic inventory of its resources and features. As this inventory becomes complete and technological capabilities for capturing geographic information improve, management of flood hazards can be tailored to specific locations. With digital orthophotos from MassGIS and a complete set of 1 to 100' scale, 2' contour maps, our comprehensive inventory will be greatly assisted.

Eroding shorelines which may require development restrictions to minimize hazards. The eroding coastal banks fronting on Nantucket Sound are losing up to 1 foot per year in some areas. Existing development restrictions via existing local, State and Federal regulations include the setbacks required under the Wetlands Protection Act (100 feet) and the Rivers Protection Act (200 feet). With the improved inventory, local restrictions can be tailored to specific areas of eroding coastal banks. In addition, the Town needs to adopt coastal bank erosion and beach nourishment requirements and monitoring procedures.

Issues surrounding the rapid erosion and potential loss of Popponesset Spit. Popponesset Spit has varied greatly in shape and length over the years. At one time it extended much farther to the east along the Cotuit shoreline in Barnstable. When the boundary line between Mashpee and Barnstable was established and marked in 1894, the spit was approximately 6450 feet in length, extending along the Cotuit shore almost to Rushy Marsh Pond. Big and Little Thatch Islands were clearly separate from the spit within Popponesset Bay, while there was a shallow break in the spit next to Big Thatch Island. The spit was also farther south, being a direct continuation of the Popponesset Beach mainland shoreline.

Today the Spit is about 3,700 feet long. It has moved about 400-700 feet inland and is lower in height as well. The tip of Popponesset Island is about 300' further inland, having been cut off by dredging in 1962. The end of the Spit is now where Big Thatch Island was located in 1938. At various times there have been openings in the spit: in 1938 one opening was at the tip near the mainland, in 1947 an entrance was halfway out, and in 1951 about one-third of the way.



Popponesset Spit in 1962 with Beach Club

In front of Popponesset Beach, a series of nine groins were installed during the early 1950's. The last groin substantially impeded the lateral flow of sand and causes the scouring inwards near the end of Wading Place Road that is noticeable today. The elevation is now lower, even minimal at high tide, with four or five places where the water flows out, in areas that were once 12 feet high. This migration, which has also greatly reduced the width of the channel between the Spit and Popponesset Island at the "Wading Place", is probably due to the presence of those nine groins at Popponesset Beach, which intercept and deflect sand migrating along the coast from its source at the eroding Succonesset Point bluffs which used to continue on and be deposited on Popponesset Spit.

Sand from the Spit is being moved into the Bay and northeast into Cotuit Bay. In recent times, Cape Cod has been hit by strong Nor'easters, bringing winds which move sand back toward Nantucket Sound. The Spit has become the weak link between two areas that were developed with sea walls and groins: the Popponesset Beach groins to the west and the Cotuit seawalls to the east. While Dead Neck at Waquoit Bay has remained relatively stable, the dynamic nature of Popponesset Spit and the changes caused by the mainland groins, along with the potential for sea level rise in the next century, make the spit one of the key problem areas in Mashpee's coastal planning efforts.

Potential options to save / rebuild the Spit. In 1972, a proposal for massive construction of channels, anchorages, a new entrance channel with jetties and a sand dike with rock groins across the entire length of Popponesset Spit was studied and rejected by the Army Corps of Engineers. Aside from the potential environmental impacts, the costs were far greater than any identified benefits. It is not likely that a similar project would be any more cost effective today, while it is even more certain that environmental regulations would prevent its construction. Although the concept of a new entrance to the Bay with some structural protection still deserves consideration, it is most likely that continued maintenance dredging of the entrance channel "deltas", as well as some smaller problem areas within the Bay (such as the mouth of the Mashpee River), is more feasible.

In 1993, Dr. Bennett E. Gordon, Jr., then Chairman of the Waterways Commission, proposed to rebuild the Spit in front of its current location, to where it was located in 1938. A groin, or jetty would be placed at the end of this rebuilt spit. To get some portion of the needed sand, the sediments that have been deposited naturally in the middle of Popponesset Bay would be moved to create the new spit. This new spit would be built to a 100 year storm level, which would require 400,000 cubic yards of sand. As management options are considered, the Spit's owners will need to be contacted. The Spit actually has four owners: Massachusetts Audubon Society on the outer portion, Fields Point and Chris Burden (the largest area) in the middle, and Fred Blythe, who owns the portion closest to the mainland.

Recommended Policies

The following recommended Policies have been proposed in an effort to guide Town agencies, residents, businesses and developers in achieving the Town's Coastal Resources Goals and Objectives. In order to provide organization, these policies have been grouped by subject category followed by a brief discussion of each category.

To address development issues in flood zones the following policies are recommended:

1. To prohibit new mounded septic systems within FEMA V zones except to upgrade existing substandard septic systems where such systems pose a demonstrated threat to public health, water quality or natural resources. Such systems shall be allowed in FEMA A zones if the required separation from groundwater is maintained.

2. To prohibit development within FEMA V flood zones, on barrier beaches and on coastal dunes except as specified in Policy #3 and except that 1) existing structures may be reconstructed or renovated provided there is no increase in floor area or intensity of use and 2) where there is no feasible alternative, water-dependent structures and uses may be permitted subject to the approval of all permitting authorities.
3. To permit existing structures in FEMA V or A flood zones, or on barrier beaches, coastal banks and coastal dunes to be reconstructed or renovated in conformance with Federal and state regulations, provided that, where such reconstruction or renovation exceeds 50% of the market value of the pre-existing structure, it shall also be designed in accordance with Water Resources Policy #24 and Coastal Resources Policies #1, #4, #5 and #27.
4. To increase by one foot within V and A Zones, as shown on the FEMA FIRM map, the base floor elevation, which is used to determine the lowest floor elevation for residential structures and floodproofing for nonresidential structures, per requirements in §174-59 of the Town of Mashpee Zoning By-law.

For management of stormwater and sediments into Mashpee's waters, three policies are proposed:

5. That no new direct stormwater discharges are permitted into any coastal waters or wetlands.
6. To pursue all available means and funding sources to reduce contamination of coastal waters and wetlands by existing sources of stormwater runoff.
7. To establish and enforce grading, drainage and erosion control regulations designed to minimize sedimentation and pollution of rivers, ponds and estuaries and to eliminate adverse sediment impacts on fisheries and shellfish beds.

The following policy addresses Nutrient loading in estuarine systems:

8. To establish and enforce land use and other bylaws and regulations designed to ensure that nutrient loading from septic systems and other land uses in their recharge area will not degrade the long-term ecological health of the Waquoit and Popponesset estuarine systems and other coastal ponds. Such regulations should be designed to reduce nutrient loading over the long term.

Three policies are recommended to assist in the development process for the construction of docks:

9. To ensure that the construction or expansion of docks and piers in shellfish resource areas will not adversely affect shellfish productivity, as required by applicable State laws and regulations.
10. To require that the replacement of docks and piers damaged or destroyed by storms is in accordance with State and Local regulations.
11. To strongly encourage community docks and shared private piers, wherever possible, as an alternative to new private dock construction that would cause loss of shellfish habitat or adverse impacts on wetlands and associated wildlife.

One policy is proposed regarding management of disposal of waste from boating activities:

12. To require the provision of, or contribution toward, adequate boat sewage pump-out facilities in each bay, collection facilities for solid waste and waste oil for patrons, and patron rest room facilities as part of any construction or expansion of marinas or boatyards having 10 or more slips, moorings or active landward storage berths. If any of these facilities are currently available, they shall continue to be offered.

To give general direction regarding dredging projects, two policies are proposed:

13. To support new or expanded dredging projects if a public benefit is demonstrated, such as the enhancement of shellfish and finfish habitats, improvement of estuarine water quality, maintenance of existing dredged or natural channels, necessary navigational safety improvements, or improvements to the flushing capacity of nitrogen sensitive embayments.

14. To allow the use of only clean dredge material that is compatible with existing sediments in any beach nourishment project.

In order to keep baseline data on water quality within the Town, the following is proposed:

15. To develop and maintain an ongoing ecological assessment and water quality monitoring program in our coastal and inland water bodies in order to determine conditions and changes, to evaluate the impacts of actions taken toward water quality improvements and to improve our regulatory and management practices.

One policy addresses research and education:

16. To support the research and educational activities of the Waquoit Bay National Estuarine Research Reserve.

To protect and maintain function of the fisheries and shellfish resources, two policies are proposed:

17. To consider impacts on fisheries resources in considering proposals for open space acquisition or protection and location of Town facilities and in reviews of permit applications for all development projects.
18. To support and maintain programs for reseeding and maintenance of shellfish beds.

An additional policy deals with aquaculture and shellfish grants:

19. To support the development of aquaculture/shellfish farms which are designed so that they are not detrimental to the other uses of the Town's waters.

Seven recommended policies relate to providing for public access to coastal waters:

20. To design development and redevelopment projects such as that they do not interfere with existing public access and public rights-of-way to and along the shoreline or with public rights of fishing, fowling and navigation.
21. To support the acquisition and development of new public coastal access points and the upgrading of existing access, including reasonable accommodations access for disabled persons.
22. To require that public coastal access be provided at publicly-funded beach nourishment sites where such access will not damage critical wildlife habitat or other natural resources.
23. To support the provision of adequate launching, mooring and other marine-related facilities for boating and other uses of the water.
24. To make all appropriate efforts to preserve our existing marinas and boatyards. Where a change to a non-water-dependent use is made, the Town will seek public access or other public benefit to compensate for the loss of the water-dependent use.
25. To encourage the inclusion of coastal access benefits to the general public in any water-dependent facilities development, provided that interference with the water-dependent use is minimized.
26. To develop water-dependent public recreational facilities on barrier beaches and coastal dunes in a way that does not compromise the integrity of coastal resources and providing that such facilities are floodproofed in accordance with state building code regulations, such as by elevation on pilings.

There are 6 policies which relate to protecting barrier beaches, dunes, eroding coastal banks, wetlands and other significant environmental coastal resource features:

27. To require that any development on or within 100 feet landward of a coastal bank or dune be designed and located so as to have no adverse effect on the height, stability, or the functioning of the bank or dune as a natural sediment source. In areas where banks or dunes are eroding, the setback for all new buildings and septic systems to the top of the coastal bank or dune crest shall be at least 30 times the average annual erosion rate of the bank or dune. This rate shall be determined by averaging the erosion rates over the previous 30-year period at a minimum. In instances, where shoreline erosion rates are

indicative of bank/dune erosion rates, MCZM shoreline change maps may be used in determining the setback.

28. To develop new public infrastructure or expansion of existing infrastructure in coastal areas only to serve existing development or provide new coastal public recreation facilities or other critical municipal facilities, but to avoid development of public infrastructure which would directly promote new private development on coastal banks, dunes, barrier beaches or A or V flood zones which could result in damage to the coastal environment, increased storm damage or loss of public recreational resources.
29. To manage vehicle, boat and pedestrian traffic, as appropriate and within the Town's authority, in order to protect critical wildlife and plant habitat areas, as listed under the Massachusetts Natural Heritage and Endangered Species Program.
30. To require the maintenance, where feasible, of undisturbed buffer areas in accordance with the Cape Cod Commission technical bulletin entitled "Wetlands Buffer Methodology Guidelines" and State regulations of coastal wetlands, banks and water bodies in order to protect wildlife habitat, the functioning of wetlands and the aesthetic character of Mashpee's shoreline, and to minimize storm damage.
31. To require the upgrading and maintenance of marine fueling facilities in accordance with best management practices in order to avoid adverse impacts on water quality.
32. To require, where land subject to coastal storm flowage is significant to the interests of flood control and storm damage prevention, that no activity shall increase the elevation or velocity of flood waters or increase flows due to a change in drainage or flowage characteristics on the subject site, adjacent properties, or any public or private way.

To provide for the safe use of Town's waters for swimming and boating, the following two policies are recommended:

33. To provide proper facilities and staffing to promote the safety of Town swimming areas.
34. To provide adequate marking of channels and navigational hazards to enhance boating safety.

Two policies have been proposed to ensure preparedness and quick response to water-related emergencies, which could threaten the integrity of Mashpee's coastal resources.

35. To maintain sufficient personnel and equipment to respond to water emergencies such as oil spills and life-threatening situations and to enforce the Town's waterways, shellfishing and wetlands bylaws and regulations.
36. To coordinate with other public agencies and private parties in response to water emergencies and in planning for long-term management of our coastal resources.

Action Plan

Regulatory/Procedural Recommendations

Water Quality Monitoring

The recommended regulatory and procedural actions the Town should take to continue to improve our water quality monitoring efforts are as follows:

1. Continue to identify guidelines, participants and sources for assistance and ongoing testing by other agencies and undertake a continuing community marine water quality assessment program.
2. The Shellfish Constable and the Mashpee River Water Quality Task Force purchased equipment to test coliform bacteria. To get information on nitrogen levels, consider the purchase of equipment to enable such tests. Any equipment to conduct in-house testing that would be beneficial (and cost-effective) to monitoring programs should also be considered.

3. Continue to assess and reassess sampling parameters appropriate to these estuaries, including specific purposes, criteria or standards, background and critical threshold levels, sampling procedures and an index of effects, likely sources, and means of mitigation.
4. Identify parameters, descriptive of intrusive environmental conditions, for various environmental features which may be observed or experienced by the many users, areas residents and visitors to Waquoit and Popponesset Bays. This would facilitate public awareness and reporting and assist in the monitoring and investigation of changing conditions within estuary waters. WBNERR is starting a process to set up citizen monitoring groups and such groups could conduct basic visual water quality surveys, among other environmental related surveys.
5. Maintain an active file on sampling and research programs within each estuary and initiate agreements or memoranda of understandings with Barnstable, Falmouth and county and state agencies and institutions (WBNERR, MBL, WHOI, NOAA) to facilitate an early notification of testing programs, an opportunity for cooperative actions and the prompt receipt of results and assessments. Either the Planning, Conservation and/or Shellfish Departments would likely house such information.
6. Continue to maintain a file of Town-wide surface and groundwater quality sampling data. This has been done at the Town Planners office and should continue to be. The public needs to be made aware of this information, particularly institutions discussed above and any educational facilities that could use the data in conducting temporal studies of water quality.
7. Initiate a community estuary sampling program, particularly utilizing opportunities offered by the new High School. The Planning, Conservation, Shellfish and Departments should assist in the coordination of such a program. With a group of high school biology students studying ecology and a location on Quashnet River there are new opportunities not previously available to the Town. There is an international program of high school students that sample river waters, called Project GREEN (Global Rivers Environmental Education Network), whose web page is referenced on the Town's Comprehensive Plan web page. Perhaps the School Department could explore joining this group.
8. Provide to the Town an annual assessment of estuary water quality, and the results of monitoring the impact of other recommendations undertaken for harbor management and estuary protection. These results should be made part of the Annual Town Report and presented in the local newspaper.
9. Continue and expand the monitoring activities of the Shellfish Department's Water Quality Task Force. WBNERR now has a staff person to assist such groups. The Cotuit Civic Association recently started to do water quality monitoring for the Santuit River and Shoestring Bay. The Association contributed some of their funding, but also received two grants including one from MA Coastal Zone Management. Citizens monitoring groups can sample waters for temperature, salinity, dissolved oxygen (DO), nutrients, and bacteria. For Mashpee different neighborhood associations and the Mashpee Environmental Coalition are possible groups to become involved in this program.

Stormwater runoff

Stormwater runoff has the potential to carry pathogens, petrochemicals, metals, salts, volatile organic compounds, nutrients and sediments that can lead to shellfish bed closures and other problems. The 1987-91 K-V Associates study of the Mashpee River and Shoestring Bay identified stormwater runoff as one of the major factors contributing to shellfish bed closures in the area. All runoff locations, in these watersheds, have been located and mapped and water quality testing has been completed during storm events at points of significant runoff. One recommended action of this study was the installation of catch basins in a number of locations.

As part of the Route 28 resurfacing project in 1993, catch basins were installed to divert the direct runoff of stormwater into the Mashpee River. Since 1993, testing has shown that runoff in this location is not a problem, thus verifying that catch basins can control runoff contamination. Just completed in the fall of 1996 was the installation of a series of catch basins to control runoff in the Meetinghouse Road area.

The Shellfish Department's Water Quality Task Force found high concentrations of fecal coliform bacteria in road runoff entering the Mashpee River at the following locations. These areas are next on the list for new catch basins:

- a) Lake Avenue,
- b) Route 130, north side parking lot (adjacent to fish ladder),
- c) Route 130, north side storm drain,
- d) Route 130, south side parking lot (adjacent to museum),
- e) Route 130, south side storm drain,
- f) Great Neck Road North, west side storm drain (where Road cross river),
- g) Great Neck Road North, east side storm drain (where Road cross river),
- h) Great Neck Road North, west side at Washburn's Pond.

Recommend regulatory and procedural options for Stormwater improvements are as follows:

1. The focus of stormwater improvements has been on the Mashpee River. Next the Town should consider their application to the Santuit River and rest of the Popponesset Bay watershed. These improvements should also be conducted in the Waquoit estuary.
2. Undertake an ongoing stormwater runoff mitigation program, which includes a stormwater facility management program for roads, ways, parking areas and ramps leading to estuarine wetlands and surface waters, including an inventory of storm drainage systems and all significant sources of stormwater runoff into water bodies and wetlands. Tests should be conducted verifying runoff problem areas. Such an inventory should include more detailed mapping than what is currently available from the K-V study. This inventory, using such data sources as aerial photos, subdivision and other site plans, should become a part of the Planning Department's Geographic Information System. This improvement and management program should be updated annually. This program is expected to be underway in 1998 with an intern working in the Planning Department sponsored by WBNERR and the Cape Cod Community College.
3. Adopt updated subdivision by-laws/special permit requirements that reflect the Mass. Department of Environmental Protection's recently adopted Stormwater Management Policy. In the past the direction of Town stormwater regulations have focused on getting the water into catch basins, which go directly into the groundwater. Such practices remove bacteria but not nutrients, which after being discharged into the groundwater work their way to the surface water bodies leading to water quality problems (see the Analysis chapter and the Nutrient Loading section to follow).
4. Conduct a storm drain painting program. The Town of Falmouth has undertaken a similar program for their Town with the assistance of grant from the Woods Hole Sea Grant program.

Nutrient Loading

To address the nutrient loading issue the following are the recommended regulatory/procedural options:

1. A subcommittee of the Natural Resources Committee, or another designated committee, should be designated as a "working group" in studying nitrogen management options and learning more about this issue. The Town created a Watershed Management Committee in May 1997. WBNERR has a lot of information on the Waquoit watershed, while the Cape Cod Commission has been studying Popponesset Bay watershed.
2. The Town of Barnstable has taken the nutrient loading information and integrated into their GIS. A similar process could be done with the Planning Department's GIS. By making use of the Assessor's parcel database, different management scenarios could be run and the results could be discussed by the Watershed Management Committee.

3. Following up on the sampling that was done during August 1997 as part of the *Nutrient Related Water Quality within the Popponesset Bay System* study.
4. Implementation of Title V revisions would be the beginning in helping the nitrogen loading on our embayments. Perhaps lobbying by either our state legislators or the Cape Cod Commission (or both) is needed to get DEP to realize that we have nitrogen sensitive embayments.
5. It is recommended that once a nitrogen management plan is completed, the Planning Board, Conservation Commission, Board of Health and Board of Appeals adopt, as part of their regulations, a specific policy to reduce nutrient loading to groundwater and surface water bodies through their regulatory authority. Among the options to be considered is the adoption of a regulation requiring that, upon the sale of a house, any septic system not providing for nitrogen reduction must be upgraded upon completion of the transfer of ownership.
6. Once each embayment's critical load has been established, the Water Quality Zoning By-law should be amended to:
 7. be based on a mass loading approach (versus concentration), and
 8. nutrient limits should be set based on the critical level of nitrogen in coastal water bodies (if exceeded, could perhaps provide for no net increase). The amended by-law could incorporate a methodology for coastal embayment nitrogen loading similar to the nitrogen-loading worksheets developed for the Buzzards Bay Project (see Appendix 6). The methodology could make use of the "nitrogen budget by parcel" approach. That approach can be tied into the wastewater facilities planning that is mentioned in item 10) below and the *Water and Wastewater Facilities* element.
9. Further reduction of development densities should be considered for those areas with 1 acre zoning that fall within a recharge area of the Popponesset embayment system. Density could be decreased to 2 acres. If the development uses denitrifying septic systems, shared systems, or an on-site wastewater treatment plant, however, the density could be increased to one acre, or even higher in the case of clustering. This concept is referred to as "Performance-based zoning" and should be given strong consideration. Although as discussed above, both embayments already suffer from excess nutrients and we need to seek new techniques to apply everywhere, this is just one tool that should be given some consideration.
10. Coordination with other Towns is critical, as both Waquoit and Popponesset Bays and associated watersheds are shared with Barnstable, Falmouth and Sandwich. Even with the decision to not designate the Mashpee River and Shoestring Bay watersheds (see Map 28) a District of Critical Planning Concern (DCPC), and having the Town created a Watershed Management Committee, which provides the forum to discuss all the management options in dealing with the nitrogen loading issue, a nitrogen management plan should address the whole watershed, not just the parts within Mashpee.
11. Integrate the hydrogeologic mapping of groundwater recharge areas of coastal ponds and bays, conducted for the Water Resources element by a consultant funded by the Town and the Mashpee Water District, into the Planning Department's GIS to assist in understanding the flow of groundwater in relation to surface watersheds, existing and potential land use patterns and ownership of property.
12. Although discussed in the Water and Wastewater Facilities element, the analysis of nitrogen management options should be used to assist any recommendations to plan and develop a Town sewer system (or systems) to reduce nutrient inputs from existing and future development, incorporating proposed private treatment facilities and collection systems as well as publicly-funded sewerage of existing densely developed areas such as Popponesset, Monomoscoy and Seconsett Islands, Pirates Cove, Little Neck Bay and similar areas. Unsewered commercial areas should be given high priority to be connected to a wastewater treatment system. As part of this study, there needs to be some discussion of innovative alternative wastewater systems and a cost/benefit analysis of what type of system produces the best results (e.g. nitrogen reduction) at the best cost.
13. Strengthen follow-up on privately-funded Water Quality Monitoring Programs under the Water Quality Report bylaw and consider putting the onus on either the developer or the homeowners/condominium association, since Town government has limited resources. For new projects this could work by making

the deed reflect an annual water quality report that must be published using association fees. Investigate the legality for requiring existing subdivisions to prepare such a water quality report since they have an impact on the nutrients entering into Mashpee's estuaries as well as new projects.

14. Strictly enforce provisions of the Town's ACEC, Groundwater Protection District & Mashpee & Quashnet River Protection Districts by-laws. The first step is to have these overlay districts mapped to become part of the Town's Zoning Map. This information can then be presented to developers, homeowners, business people and citizen groups.
15. Continue efforts to acquire conservation lands & conservation easements in recharge areas (see Open Space element).
16. Regarding the use of fertilizers/pesticides, develop a Town-wide education program to achieve a long-term reduction in the use of these materials. Study this issue further as part of any nitrogen management plan.
17. As discussed in the Heritage Preservation/Community Character element consider adopting as part of the subdivision by-laws clearing limits on new development. Maintaining tree cover will help the nutrient loading situation by having less area to apply fertilizers and more plant life to absorb the nitrogen.

Aquaculture

Privately licensed shellfish growing areas (farms) also referred to as shellfish grants are issued by the Board of Selectmen after a public hearing. If approved the application is then reviewed by the Massachusetts Division of Marine Fisheries (DMF). The DMF conducts a shellfish survey to determine if the area is naturally productive. If it is unproductive, the DMF approves the application. Then it is reviewed by the US Army Corps of Engineers. The applicant must also file a Notice of Intent with the town Conservation Commission. Licenses may be for not more than 10 years and may be renewed for 15 years.

Under MGL Chapter 130, Section 64, license fees are limited to \$25 per acre per year. A larger benefit to the Town is enhancement of the shellfish resources for recreational and commercial shellfishing. Shellfish being cultivated on the farms spawn before they are harvested. The shellfish larvae from the spawns swim and are carried by the tides to set and grow in other areas. Another benefit is economic development. The value of the harvested shellfish is increased several fold in the local economy, and aquaculture jobs help reduce unemployment.

The Mashpee Shellfish Department has been engaged in aquaculture since the late 1980's. A Town By-law has been adopted requiring all shellfish permit fees to be used for shellfish propagation. Small quahog seed purchased from local hatcheries is grown in trays in the estuaries and then planted after growing to a large enough size. New programs with oyster and scallop seed have recently been started.

Nationally, aquaculture is one of the most rapidly growing sectors of the economy and is the fastest growing agriculture segment, growing an average of 20 percent each year. Shellfish farming is the largest segment of aquaculture in Massachusetts, which has some of the best shellfish growing area in the world. Cold clean waters provide an excellent product that is internationally recognized. Although demand for the product is increasing, acreage available for shellfish culture is restricted.

Currently all aquaculture in Mashpee is shellfish farming. Mashpee now has 3 farms and a new one was recently approved by the Board of Selectmen.

Aquaculture grants need to be a sufficient size to allow for economy of scale in operations. This is also a local control decision. Decision-making bodies in coastal communities need to know that ½ acre shellfish grants are not large enough to provide a full time stable income. At least 2-3 acres is recommended if the

business is to become large enough to provide employment to individuals other than the lease holders. However this area should be approved with previously determined room for expansion (if feasible) up to 5 acres, if not 10 acres, providing the operator follows the regulations in effect.

As prime aquaculture space is limited, it is imperative that usable grounds be available to individuals that will produce results. Therefore, a “threshold of performance” is required for licensees to ensure that available bottom areas are not wasted. The Shellfish Commission recommended a requirement to seed 10,000 shellfish seed per acre per year after researching the changes that other towns have made, and suggestions from other groups including Mashpee shellfish farmers. Other towns require \$250/acre/year minimum harvest requirement with exemptions for losses due to natural disasters, or other causes. Others have raised the requirement as high as \$1,500/acre/year. Mashpee needs to determine an appropriate performance threshold for incorporation into its licensing process.

Such thresholds, grant size, appropriate number of grants should be addressed through the development of an Aquaculture Plan. The planning process should include the Conservation, Economic Development, Harbormaster, Planning, Shellfish, and Waterways Commissions and Departments as well as shellfish farmers, including the Tribal Council for a coordinated approach.

One part of the process will be to determine if we want to map out coastal waters to specify where shellfish grants could or could not go. Some other towns have mapped potential shellfish aquaculture areas, and others have not. These are areas where prospective applicants can apply for new aquaculture projects. The revisions should consider all users of Town waters. The checklist of what an applicant has to do to get a shellfish grant approved would also be revised.

Shellfisheries and Docks

The regulation of shellfishing in Mashpee predates its incorporation as a Town in 1870. The position of Shellfish Constable is one of the oldest in the Town, reflecting the fact that the Town’s fishery resources have long been of prime importance to its residents.

Regulation of shellfishing for clams, mussels, scallops and oysters and of the taking of eels continues to be promulgated by the Board of Selectmen and enforced by Shellfish Constable and his assistants. The primary intent of the Town’s shellfish regulations is to prevent overfishing, to prohibit shellfishing in areas closed due to contamination, the regulation of commercial shellfishing and the establishment of private shellfish license areas (farms).

Within the Mashpee Zoning Bylaw a number of regulations are directed specifically at the regulation of dock construction and the protection of fisheries. Under Section 174-25 the construction of docks and similar items requires a special permit from the Board of Appeals.

In considering changes to the current regulations on permitting of docks and other uses along the coast, a number of factors must be kept in mind. The first is that the land below extreme low tide in coastal areas belongs to the state, unless specifically deeded otherwise. In addition, the land between the high and low tide lines is subject to “public trust rights,” protected by the state constitution, 310 CMR 9.00 and decisions of the state Supreme Court. Those rights allow all citizens of the Commonwealth to engage in fishing, fowling and navigation and the right of access from the water and access along the shore below mean high water to pursue those rights. State ownership of land under water and the public rights in the land between high and low tides are the basis for Chapter 91 and the licensing regulations promulgated by the state for proposed private use of public lands and lands having public rights. The same legal issues, along with other

issues of public health and safety, underlie municipal authority, which is derived from the state, to regulate the construction of docks and other coastal structures.

Also to be considered is the fact that tax revenues from docks exceed the net revenue from the shellfish industry. For FY 1996 the Town received \$33,080 in permits for salt water docks, while taking in \$6,800 for shellfish permits. Although regarding shellfishing, it is hard to put a dollar value on an intrinsic resource that has provided subsistence to generations of native families. Studies are also showing that the two can exist together.

1. One recommended policy of this element is to review the construction or expansion of existing docks in shellfish resources areas such that they will not adversely affect shellfish productivity. As the *Analysis* section showed, the Harbormaster, Shellfish Constable and the Conservation Agent are actively managing dock construction as such to minimize disruption. In fact this policy is already in effect but should be documented. Their activities should be documented as best management practices (BMP's) to ensure that future officials undertake the same level of review.
2. It should be required that Town agencies and boards responsible for review of projects or activities affecting shellfish resources or other designated resource areas require that applicants provide evidence of a pre-application conference with the Shellfish Warden (and Shellfish Commission), Conservation Agent (and Conservation Commission), Harbormaster (and Waterways Commission). This proposal could be accomplished by having these individuals be a part of the proposed Departmental Site Plan Review Committee (see *Public Safety* and *Solid Waste* elements) when a proposal affecting a shellfish resource area arises.
3. Prepare, using the Planning Department's GIS, accurately-scaled maps of the shellfish resource areas for those waterways within the Town. Any necessary modifications of shellfishing areas and mooring and other marine activity areas should be conducted on an annual basis.
4. Establish a survey, monitoring and assessment program, with inter-agency and volunteer assistance, for other estuarine species and habitats, particularly those which are threatened or endangered and intrinsic to an ecological diversity and balance. This proposal could be integrated with the recommendations under Water Quality Monitoring. In addition, the USEPA initiated the Environment Monitoring and Assessment Program (EMAP) in 1990, which has included work in Waquoit Bay. WBNERR has this data, which the Planning Department plans to obtain. It could be explored if this initiative could be expanded for other areas of Town. The Planning Department could use its GIS to store, present and analyze the data.
5. Provide a public informational handout with dock permits describing guidelines for boating, mooring, docking, and boat storage with respect to resource areas. In 1994, the Waterways Commission and Harbormaster Department began to produce something similar. Such a product has been identified on the five-year action plan.
6. Initiate a program to seek voluntary conservation easements by public agencies or private land trusts where shoreline habitats are critical to estuarine species survival. The use of conservation easements would leave the property in private hands but include permanent deeded restrictions against development. In exchange, landowners pay reduced taxes on the property and may receive federal income tax and estate tax incentives. The Planning, Conservation and Assessing Departments should work together on this project.

Public Access

Subdivision and other permit approvals in the past may have not sufficiently protected, or investigated, possible public rights of way to the water. Such rights may have been established under the doctrine of "prescriptive rights," which are very difficult to determine and have been considered by past boards to be outside their jurisdiction. Historically many of the ways that were actually constructed by the Town were

not properly laid out and recorded with the County Commissioners as required by the General Laws. As a result, their status is vague and has, in a number of cases, been the subject of much controversy. The Mass. CZM *Preserving Historic Rights of Way* booklet provides a starting point on ways to restore historic rights of way based on prescriptive rights. Mass DEM, Division of Resource Conservation provides a mediation service when conflicts arise around the issue of public access to the coastline.

The Town currently does not have a specific policy adopted with regard to these issues other than the policies and goals relative to Waterways which were adopted in 1986 by the Committee on Mashpee's Goals and Priorities (see Appendix 3). With regard to current regulations, they approach the issue from two directions. First, there are the Wetlands Bylaws and regulation and the Zoning Bylaws which regulate construction of facilities along the coast. Second are the Town's Bylaws on the use of Waterways, which regulate boat speeds, marine-related pollution, moorings and other objects, water-skiing and jetskiing, divers and diving. Chapter 170 of the Mashpee Bylaws governs.

Proposed Regulatory/Procedural Changes to address Public Access:

1. Local regulations, including the Zoning by-laws and Wetlands Regulations, should include clear explanations of public ownership of submerged lands, public trust rights of fishing, fowling and navigation within the intertidal zone and the requirements of MGL Chapter 91. These regulations should incorporate specific requirements for maintenance of lateral access along the shore in public trust lands which are consistent with MGL Chapter 91 and implementing regulations. Bathymetric mapping, which has been generated the Barnstable County Dredge Program for the Master Dredging Plan, could be integrated with the Planning Department's Geographic Information System. With this information overlaid onto the Assessor's maps along with other shoreline maps, the location of the trust lands can be more accurately identified, which can assist dock applicants, shellfishermen and the decision-making bodies in determining the areas subject to MGL Chapter 91.
2. It is recommended that the Town's Natural Resources Committee inventory and investigate the legal status of all known and possible public landings and access to coastal waters and great ponds, to develop a public access plan and development program, to review proposed permits for development and structures along the coast and pond shores with regard to protection of public access rights and public trust rights and to educate the public on access rights and responsibilities. It is suggested that the Committee create a subcommittee to include besides those already on the committee, representatives from the Historical Commission, Mashpee Wampanoag Tribal Council and other interested citizens appointed by the Board of Selectmen. Specific legal issues should be forwarded to Town Council. To give further credibility to this process, the Town, possibly by vote of the Board of Selectmen, should adopt a policy to protect, by all legal means, existing historic public access to inland and coastal water and enhance such public access where possible. To serve this function, the charter of the Natural Resources Committee may need to be changed to add a public access advocacy to its list of purposes.
3. Budget for maintenance and improvement of existing public access sites. Currently there is not one Department that maintains the Town's water access areas on a regular basis. A forum should be initiated between the DPW, Leisure Services, Harbormaster, among other departments/committees to discuss how this issue shall be addressed. If more money is needed for maintenance, then perhaps the issue could be placed before Town Meeting voters. Specific improvements to existing sites:
 - a. Ockway Bay Boat Ramp: This site was identified as an underutilized site. If a channel was dredged from the ramp to Popponesset Bay and/or a planing channel established this site would likely see more usage. An analysis of this site revealed that the parking lot only takes up about 10% of this existing Town-owned parcel.
 - b. Great River Boat Ramp: consider adding a dinghy dock and provide additional parking. An analysis revealed that parking could be expanded three times the existing amount.

- c. Mashpee Neck Road Boat Ramp: added parking would facilitate greater use of site, for not only boats, but also canoes and other small craft. Analysis of this property shows room for only a limited number of new parking spots. Overflow parking could be made available at the Mashpee River Woodlands parking area north of this site.
- 4. Investigate new sites for public landings at the following locations: (Problems/obstacles facing the development of any site, whether for boat landings or just as a way to water include: lack of parking, neighborhood acceptance of new access areas and maintenance. Before developing new boat landing sites, the Town should first look to improve existing sites as discussed above.)

Waquoit Bay:

- a. The 10-acres parcel at the end of Will's Work Road is now under Town ownership. This property, which has been discussed as a possible Marina site, could be developed for some low impact public access. A docking facility could be developed for small craft (dinghies, sailboards, kayaks and canoes) and would provide improved access for those enthusiasts and owners of boats moored in Waquoit Bay. Parking space could enhance access for hunters during the hunting season, and hikers, waders, and bird-watchers during other seasons.
- b. "Bufflehead Bay" land fronting Jehu Pond: Now that this property is publicly-owned, a landing access site could be given strong consideration. In fact, as part of the purchase of this property, an easement was granted to the U.S. Fish & Wildlife Service for "roadway and passage" to Jehu Pond. Such an access site would likely be the carry-in type for canoes, kayaks and other small craft.

Popponesset Bay:

- c. Simons Narrows Road at Shoestring Bay (Mitchell's Landing). The first step would be to do a title search on this property.
- d. Jackbon Terrace: The layout of Jackbon Terrace runs to Shoestring Bay. The Harbormaster attempted to apply for a grant application to improve this site as a boat landing. The ownership, however, is in private hands and not Town-owned. If the Town can purchase this right-of-way, such a concept could again be considered here (see Map 30).
- 5. One type of recreation usage which the Town currently lacks is picnic areas, or other general places to sit and view the 26+ miles of Mashpee's coastline. The Department of Public Works has expressed concern about maintenance associated with the placement of picnic tables or benches on Town-owned property, particularly being held responsible cleaning up the picnic tables and mowing around either tables or benches. In order to provide such facilities to Town residents and visitors for more passive recreation experiences, perhaps a special partnership could be developed between the Town, its businesses, non-profit groups and neighborhood associations. An "Adopt-A-Seaview" program could be created, where businesses donate funds to construct a bench, which could have their name engraved. Either a non-profit or neighborhood group would then agree to maintain the site at intervals to be agreed upon. Their name could be engraved into the bench or table as well. Such an idea may be worth one initial test to see if the maintenance would be acceptable. Otherwise, the Town could vote to appropriate more funds to DPW to provide the appropriate level of service needed for maintenance.

Sites to be investigated for ways to water, which could provide small craft landings, shellfishing, and scenic access include:

Waquoit Bay:

- a) Town-owned land at the north end of Bayview Road on Seconsett Island, shown on Map 20 as Site 1. As the site is a marshy area, it offers potential for passive use, like scenic access, or a carry-in site for small craft. An island reachable by foot at low tide accessible from the end of Bayview Road is now publicly-owned by the U.S. Fish and Wildlife Service. Parking opportunities appear limited at this site.
- b) Monomoscoy Island Causeway: one proposal that should be considered is the construction of a pedestrian boardwalk to be located adjacent to the roadway. Such a boardwalk could have one or

more “benches” incorporated into its design (see Map 31). If public access to this area is to be provided to a wider range of population than neighborhood residents, parking will have to be provided.

- c) “Bufflehead Bay” land fronting Jehu Pond. The development of a trail network could include places to stop and view the water at certain locations. As was done at the Mashpee River Woodlands, small wooden benches could be placed at these waterview locations (see Map 29).
- d) The “Salzter” property on Whippoorwill Circle, discussed in the *Analysis* section, has the potential to be considered as a picnic area and/or other scenic access (see Map 32). It could even be considered as a fisherman’s way to water if a stairway was provided.
- e) A Town-owned parcel (Map 114 Block 12) containing 0.16 acre and 50 feet of frontage on Monomoscoy Road West, fronts on privately-claimed marsh on Hamblin Pond and might serve as visual access, or even as a small craft landing if the marsh were acquired (see Map 31).
- f) Two marsh parcels shown on Map 114, Block 5A and Map 120 Block 46 contain 0.55 acres and over 500 feet of frontage on Hamblin Pond but have no landward public access. Public access to these properties should be investigated further (see Map 31).
- g) On Monomoscoy Island, there are a number of subdivision road layouts that run perpendicular from Monomoscoy Island Road to Hamblin Pond and Great River, these include: Child’s Road, Portage Road and Russel Road. Although privately-owned, they should be investigated further for possible public usage for scenic access, particularly where the opportunities exist to get public ownership of one or more of the adjacent parcels along the waterfront.

Popponesset Bay and Nantucket Sound:

- a) Santuit Causeway: since this location is on the Town Line with Barnstable, coordination may be needed between the two towns, depending on the extent of scenic access.
- b) The “Stenberg” parcel, Map 95 Block 8, a part of the Mashpee River Woodlands, has the potential for a trail to be developed to the Riverfront. This site may offer a nice place to picnic, view the river and its activities as a scenic access location (see Map 33). Parking facilities could either be added or those adjacent parking areas within the Woodlands may suffice. It could also be considered as an additional site for a canoe/small craft landing site.
- c) Rock Landing (see discussion in the *Inventory* Section on Historic Rights-of-Way)
- d) Shore Drive at Dean’s Pond (see Map 18, site 8): the exact rights of the public to use this site for scenic purposes could be defined more clearly.
- e) Mashpee Neck Road Town Landing: subject of a submitted CZM *Coastal Access Program* grant application to improve public access for scenic purposes, which could lead to improved access opportunities in the future (see Map 18, site 15).

Other roads in public ownership may provide scenic access, small craft tie-up, launch or landing. In addition, this information should be updated as part of the Comprehensive Plan update process, reflecting changes to the status of ownership, additional site development, etc.

Waterways

Regulatory/Procedural Recommendations for the management of Town waterways:

1. Designation, mapping and subsequent adoption of a Multiple Use Water Management Plan showing recommended areas for compatible or exclusive uses, including shellfishing, eelgrass bed protection, aquaculture grants, swimming areas, windsurfing, water-skiing, docks, permanent mooring areas, emergency storm anchorages, temporary mooring areas, channels, marinas, scientific research and other appropriate water surface uses, should be undertaken utilizing all available input from Falmouth, Barnstable, WBNERR, and DEM.
2. Develop and/or make any changes to existing Town Bylaws and waterways regulations to enforce the designated water uses.

3. Adopt new speed regulations, where necessary.
4. Upon adoption of a Multiple Use Management Plan, provide a public information program of markings, postings and the distribution of descriptive mapping and information on recreational areas, resource areas, emergency assistance and other procedures.
5. Continue enforcement of boating regulations. Increase funding and staffing for Harbormaster department to meet projected growth (see *Public Safety* element for recommendations regarding expansion of Harbormaster staff).
6. A speed zone and restriction areas map should be sent to each applicant for a mooring, to slip owners at marinas and to those paying boat excise tax in Mashpee. Each mooring applicant receives a summary of boating regulations and moorings regulations. Expanded distribution could be accomplished if secretarial support is provided to the Harbormaster Department.
7. The Town's Harbormaster Department should continue to enforce the established mooring procedures in place now and keep database of mooring records updated. The moorings database is running on an obsolete computer system in need of upgrade. Also look into development of a Coastal Resources Information System (CRIS), which would serve to coordinate permit and other information regarding coastal resources on an interdepartmental basis. Perhaps it could be integrated into the existing network at Town Hall.
8. Make sure there continues to be coordination between the Shellfish Constable and Harbormaster for location of moorings in shellfish resource areas. As discussed in the Shellfisheries and Dock Management section, formalize the active management between these two departments by compiling a best management practice (BMP) report.
9. As this plan has shown, the number of moorings which can be accommodated in Mashpee's coastal waters without damage to important natural resources is not unlimited and that, as a result, not all applications for future moorings can be accommodated. A policy could be put into place stating the limitations of new mooring fields beyond existing and planned sites.
10. Provide assistance and an incentive program to encourage improvements to access, parking, ramp and stormwater runoff retention at existing marinas, and cooperative agreements to facilitate greater access to launching facilities by the general public.
11. Establish a public awareness and enforcement program to ensure safe use of coastal and inland waterways by all boaters and protection of water quality.
12. Investigate all available sources of federal and state funding assistance for waterways and related facilities.

Dredging

The Recommended Regulatory and Procedural Actions for future dredging are as follows:

1. Develop a Master Dredging Plan, to be accompanied by a dredging maintenance program and a dredging contingency budget. The Master Dredging Plan should include the location, width and depth of channels, location of spoil disposal sites among other items, some of which are highlighted below. The Master Dredging Plan should be developed and adopted with extensive public input. It is suggested that primary responsibility for development of such a plan lie with the Waterways Commission and the Harbormaster, but that any plan must be approved, after public hearings. This Plan should be reviewed and updated at five-year intervals, while the maintenance program and budget should be reviewed annually. As appropriate, the dredging plan, maintenance program and budget should be developed jointly with Barnstable and Falmouth and in cooperation with county, state and federal agencies
2. Plans for disposal of dredging spoils must conform to all local, county, state and federal regulations in order to secure dredging permits.
3. In developing proposed dredging projects, all cost items must be considered, including: consultant fees, costs of the necessary permitting process, fees for plans and engineering, fees for sediment sampling,

dredging contract items such as equipment rental, personnel (superintendent, operator, deck hand), fuel, insurance, the cost of Town employee time and the cost of Town equipment used in dredging operation.

4. Until a Master Dredging Plan is complete, conduct maintenance dredging as discussed for the identified areas of Waquoit and Popponesset Bays.
5. The Town's Waterways Improvement Fund (sources described in the *Analysis* chapter) should serve as the initial source of local funding for dredging studies and improvement projects, supplemented by voluntary contributions from boaters and others (Save Popponesset Bay group for example), state and federal funding assistance and, when necessary, Town funding derived from the general fund or municipal bonds. Other sources include those boaters that use Mashpee waters that are not currently contributing to the Waterways Improvement Funds.

Emergency Planning

1. Town agencies in considering recommended actions from the Town's Public Safety Plan and Comprehensive Emergency Management Plan should:
 - a) ensure that a mapped inventory of critical coastal resources and harbor facilities, along with local access routes, ways, and ramps is maintained.
 - b) ensure that a descriptive inventory of equipment and facilities available (and desirable) locally is maintained;
 - c) ensure that emergency response training is available to both Town personnel and residents (at a minimum the Coast Guard and MEMA should be encouraged to sponsor annual oil spill response drills). Trained personnel must be designated to provide staffing as needed.
 - d) Develop a set of specifications along with a map for areas of Mashpee's waters where oil spill dispersant materials can or can not be used. In addition, for areas where dispersant materials can be used, the exact amount is based on the water depth. The specifications should include this information as well.
2. The Town should complete the application process for the National Flood Insurance Program's Community Rating System while developing a more detailed flood management plan which includes:
 - a) emergency management and evacuation procedures
 - b) measures for storm or flood preparedness, and damage reduction
 - c) post-storm procedures for clean up, hazard management, and rebuilding and response to change in land form
 - d) structures or stored materials within storm hazard or surge areas, or subject to sea level rise
 - e) sea level rise (in respect to utilities, services, relocation, and shoreline "armoring")
 - f) nutrient management or impact mitigation needs
3. The Town should conduct a study of primary emergency access roads to coastal areas subject to flooding to determine what portions of such roads might be made impassable by flooding in a 100-year or 500-year flood. Where feasible, such locations should be raised above flood levels as part of the Town's on-going road maintenance and reconstruction program (see *Public Safety element*).

Five Year Action Plan

Specific currently-proposed activities during the next five years are as follows:

Year 1

- The Town shall begin work on the ACEC Management Plan for Waquoit Bay. The necessary first step is to work with the Mass. CZM to outline the state requirements for ACEC management plans relative to the Mashpee portion of the Waquoit Bay ACEC. Once completed, actual work on the ACEC Plan

itself shall begin. Once again, The Natural Resources Committee should assist in developing the plan with assistance from individual town agencies as needed.

- Development of preliminary trail and access plans for “Bufflehead Bay.” The access plans shall include the identification of appropriate location(s) for small craft landings and scenic access. Any plan development shall include the management committee responsible for managing the Mashpee National Wildlife Refuge.
- Develop a Master Dredging Plan for Mashpee’s waterways. The Waterways Commission is working on obtaining permits to do new dredging in the Popponesset Bay area as part of developing the Master Dredging Plan. The Planning Department will work with the Waterways Commission to get this information for both the *Capital Facilities* element of the Comprehensive Plan and the Master Dredging Plan.
- If funds from the CZM Coastal Pollution Remediation (CPR) program for the installation of 8 catch basins in the Route 130/Great Neck Road area of the Mashpee River are received, then installation of these catch basins shall be conducted.
- Apply for next round of CPR funds, including necessary grant preparation work, for stormwater improvements in the Santuit River sites identified by the K-V Associates study.
- Planning Department shall begin mapping of stormwater drains, and direct surface runoff locations, into its Geographic Information System (GIS). Such mapping will begin by making use of DPW maps and documents, road layouts, subdivision plans.
- The Shellfish Constable and the Planning Department shall prepare updated Shellfish Resource Area maps.
- Phase I of Nitrogen Management Study to be conducted by Dr. Brian Howes and the Center for Marine Science and Technology as part of the work being done by the Watershed Management Committee.

Year 2

- The Town shall prepare an update to the *Coastal Resources Management Plan and Municipal Harbor Management Plan* for submission to the State. The Town has to address Chapter 91 issues among other items. The Chapter 91 issues include a discussion of the application of the State’s Chapter 91 waterways licensing process in Mashpee, the recommendations received from the state regarding Chapter 91 related modifications of the 1991 draft *Municipal Harbor Management Plan* and the changes to our plan and steps required for state certification of the plan. The Natural Resources Committee, formerly the Coastal Resources Management Committee, should assist in this plan development and review, hold public meetings and hearing, and any other items necessary work to complete the *Harbor Management Plan* for submission to the State. The Planning Department, Waterways Commission, Harbormaster, Shellfish Constable, Shellfish Commission, Conservation Commission (Conservation Agent) with assistance from the “*Working Group*” for this element, will be the responsible party for the preparation and development of this work item.
- Either as part of the Coastal Resources Management Plan and Harbor Management Plan update, or as a separate document, a Multiple Use Water Management Plan should be developed for the Town's coastal waterways showing recommended areas for compatible or exclusive uses, including shellfishing, eelgrass bed protection, aquaculture grants, swimming areas, windsurfing, water-skiing, docks, permanent mooring areas, emergency storm anchorages, temporary mooring areas, channels, marinas, scientific research and other appropriate water surface uses, should be undertaken utilizing all available input from Falmouth, Barnstable, WBNERR, and DEM. The development of such a plan should be coordinated by the Waterways Commission, Harbormaster, Shellfish Constable, and the Planning Department. (If determined to be a separate plan, move to Year 3)
- Resume discussion of options on how to save the Spit. The Natural Resources Committee provides the forum to begin this discussion. Outside experts/assistance should be called in as needed.

- The Town, through the Planning Department, shall apply for the National Flood Insurance Program (NFIP).
- The Planning Department shall map the Town's ACEC, Groundwater Protection and the Mashpee and Quashnet River Protection overlay districts to become part of the Town's official zoning map.
- The Town's Natural Resources Committee shall address the preservation of historic rights-of-way to the sea and assisting in prioritizing the development of additional landings and scenic access projects.
- The proposed Departmental Site Plan Review Committee shall be created with the Conservation Agent, Harbormaster and Shellfish Constable providing input on development proposals affecting shellfish and other designated resource areas.
- To provide for passive recreation uses, such as sightseeing and picnicking, of Mashpee's Coastal Resources, develop a test case "Adopt-a-Seaview" program for one of the recommended ways to water improvement sites. This effort should be coordinated between the Harbormaster, Planning Department, Community Development, Public Works, and the Chamber of Commerce.

Year 3

- Develop and adopt any necessary By-laws for the implementation of this plan, the *Coastal Resources Management Plan and Municipal Harbor Management Plan* update, and the Multiple Use Water Management Plan (for the latter, if completed).
- If not started in Year 2, prepare a Multiple Use Water Management Plan for Mashpee's coastal waters.
- With permits expected for dredging of the Mashpee River, conduct necessary Town Meeting and other actions to fulfill funding requirements. Then proceed with dredging in February 1999.
- The Shellfish Constable and Commission, Conservation Agent and Commission, and the Harbormaster and Waterways Commission shall compile a Best Management Practice (BMP) report on how they manage location of docks in Shellfish Resource Areas.
- The Natural Resources Committee's Public Access subcommittee shall begin to list all possible public access projects, prioritize them, and start dealing with them.
- With the development of stormwater drain and runoff mapping, begin a Stormwater Runoff Facility Management Program. Coordination between the Planning and Public Works Departments will be needed.
- Continue the installation of catch basins on roadways within the Lower Popponesset Bay watershed (via the CPR program).

Year 4

- Provide a public information program for items related to the Multiple Use Water Surface Plan.
- Now that the High School has all 4-grades, make use of students in conducting a community-wide estuary and water quality sampling program. To be a combined effort between the School Department, Shellfish Constable, Conservation Commission and the Planning Department.
- Stormwater improvements shall begin in the Waquoit Bay watershed.

Year 5

- Begin an annual review of the maintenance dredging permits from the State for the channel in Nantucket Sound, the entrance to Popponesset Bay and the channel between the main Waquoit Bay channel and Great and Little Rivers. The annual review will lead up to the ten-year deadline for the permits.
- Begin collecting information for update to *Coastal Resources* element.

Coordination with Surrounding Towns, County and Other Agencies

As Mashpee shares its coastal bays with Barnstable and Falmouth, the issues affecting the management of our coastal resources go beyond our boundaries. Popponesset and Shoestring Bay are impacted by land use decisions in Barnstable (Cotuit), and Waquoit Bay by Falmouth. In addition, a southerly portion of Sandwich serves as the headwaters for these watersheds. In planning for the protection of our coastal resources, coordination is needed with regard to: stormwater runoff, nitrogen loading, dredging, waterways and surface water uses, and emergency planning.

The Cape Cod Commission's Nitrogen Loading Study recommended the creation of a working group to review the findings of that study. It was suggested that this group be made of representatives from Mashpee, Sandwich, Barnstable and the Commission. In addition, business representatives, including Fields Point Corporation and Willowbend, should also be considered. The purpose of this group would be to coordinate with town and Commission staff to develop appropriate management options for remediation of the Popponesset Bay system. These options should also include plans to minimize the associated economic impacts. Their suggestion has come to fruition with the Town's Watershed Management Committee.

As suggested by the Commission's report, the Town Manager of Barnstable nominated three people to serve on a intermunicipal working group, including a DPW staff person and a Board of Health representative. Mashpee has not gotten this far, and should nominate such a group. In December 1996, the Cotuit Civic Association voted to support the designation of the Shoestring Bay DCPC. This letter was sent to the Mashpee Board of Selectmen. What will need to emerge, regardless of the DCPC designation, is a coordinated management plan for the Shoestring Bay watershed between the two Towns.

To date Barnstable has not taken much interest in Shoestring Bay. With the village of Cotuit being affected by the algae bloom in Shoestring Bay, which was the worst ever in the summer of 1996, their interest may begin to increase. One example of coordination needed is in the area of stormwater runoff. This plan has identified improvements that have been done and are continuing in the Mashpee River watershed. The proposed next step is to move to the Santuit River/Shoestring Bay/Lower Popponesset watershed. Such improvement will require cooperation with Barnstable. Their Comprehensive Plan includes a "Stormwater Priority Listing" with Shoestring Bay not receiving high priority on this listing

In addition to the data for Barnstable included in the Commission's *Nitrogen Loading Study*, Barnstable has collected their own data for the nitrogen loading issue. They could either conduct analysis (of their portion) of the recharge area to Shoestring Bay, or give Mashpee the data. Such data swaps are planned for other elements of the Comprehensive Plan as well.

Mashpee and Falmouth share their border along Waquoit Bay and its watershed. Waquoit Bay has been designated as an ACEC, the boundaries of which are shared by these two Towns. Also located here is the federally designated Waquoit Bay National Estuarine Research Reserve (WBNERR), which includes 2,250 acres in both towns. To coordinate planning efforts for the Waquoit Bay watershed, WBNERR has sponsored an intermunicipal Resource Protection Sub-Committee, made of technical and regulatory officials from the two towns. In addition representatives from the Cape Cod Commission, and various state agencies, e.g. Division of Marine Fisheries, also serve on the subcommittee.

The Resource Protection Committee, however, has not met with any frequency. They met only once in 1996. It is suggested that this Committee meet at least quarterly; perhaps each agency could take turns planning and coordinating a meeting.

WBNERR is awaiting critical loading data, being generated by a grant through the EPA's Ecological Risk Assessment program. This data will help complete a nitrogen loading model for Waquoit Bay. In addition, WBNERR is sponsoring a national demonstration study of denitrifying systems. Mashpee's Conservation Agent has been working with WBNERR research associate, Richard Crawford, in conducting a study on the effects of boat discharges. WBNERR worked with the Town in helping locate a site to place the spoils from the Great River channel dredging project and is active in assisting in the management of the National Wildlife Refuge.

Falmouth, at this time, is not doing much work in the Waquoit Bay watershed. The stormwater runoff issues affect them too, and improvements should be a coordinated effort. WBNERR could serve as the coordinating party between the two towns.

As the Town works to complete an update of its *Coastal Resources Management Plan and Municipal Harbor Management Plan*, the Chapter 91 issues it needs to address will require coordination with the DEP Division of Waterways.

Emergency planning needed to protect our waters for spills and/or boating accidents requires coordination between the Massachusetts Emergency Management Agency, the United States Coast Guard, and the Harbormasters of Falmouth and Barnstable.

